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UNITED STATES
DEPARTMENT OF THE INTERIOR
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BUREAU OF MINES
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GEOPHYSICAL ABSTRACTS 125

APRIL - JUNE 1946

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GEOPHYSICAL ABSTRACTS 125
April - June 1946[1]

Compiled by V. L. Skitsky[2]

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FOREWORD

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1. GRAVITATIONAL METHODS

8485. Forbush, S. E. Gravity Determinations on the Carnegie. Scientific Results of Cruise VII of the Carnegie during 1928-29. Carnegie Institution of Washington, Pub. 571, 1946, pp. 69-81.

Observations made during the 7th cruise of the Carnegie, 1928-29, included gravity determinations. These were the first measurements of their kind aboard a sailing vessel at sea. A Meinesz gravity apparatus was installed at the ship's center of oscillation; it consisted of three nearly isochronous pendulums swinging in the same vertical plane. The equipment also included chronometers, photographic recorder, time-signal amplifier, radio apparatus, etc. When at sea, the aural method was used, which is the same as for coincidence determinations between two chronometers. The theor of the apparatus, effects of vertical acceleration and angular movements, tests, records, and reductions are discussed, and the method of observation and behavior of the apparatus aboard ship are described.

Few successful determinations were obtained at Pago Pago, Penryhn, and at sea; they are tabulated. Various difficulties of gravity measurements were studied and some of them eliminated. - V. S.

8486. Kogbetliantz, E. G. Estimating Depth and Excess-Mass of Point-Sourc and Horizontal Line-Sources in Gravity Prospecting. Geophysics, Menasha, Wis., vol. 11, No. 2, 1946, p. 195-210.

The problem of the exact quantitative determination of the depth and total excess mass M of a point- and a line-source is solved with the aid of moments of the mapped gravity anomaly gm, the correction for the regional anomaly being supposed as already applied. The solution does not presuppos that the constant error E in the regional datum is zero, and this error is deduced from the gravity map itself. The relative errors that may affect the given estimates of p, M, E are studied, and the magnitude of their upp

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limits is estimated in the case of a point-source only, as the same analysis can easily be extended to a line-source. The recommended method of solution reduces the harmful influence of extraneous anomalies from shallow mass points. The details of mathematical proofs are given in an appendix. Author's abs.

8487. Marcantoni, A. Sulla localizzazione di un corpo sferico e assimilabile ad una sfera mediante misure eötvössiane (On Locating a Spherical Body Identifiable with a Sphere by means of the Torsion Balance of Eötvös). Geofis. Pura & Appl., Milano, vol. 2, 1940, No. 2, pp. 113-120, Nos. 3/4, pp. 200-215.

Part 1. The author demonstrates that it is possible to prove the existence of an anomalous spherical body in the subsurface from the values of Eötvos derivatives. One needs first to satisfy the necessary equations; then it is only necessary to occupy two stations for determining and locating the body's mass. The equations are deduced.

Part 2. Several formulas are presented for calculating the mass and the coordinates of the position of a sphere approximating closest the anomalous subterranean body surveyed by torsion-balance. - Author's abstracts, translated by V. S.

8488. Medina, M., Carreno, A., and Toscano, R. La gravimetria en Mexico (Gravimetry in Mexico). Direccion de Geografia, Meteorologia, e Hidrologia; Estudios y Resultados de las Determinaciones Gravimetricas, Mexico, 1944, 151 pp.

The Mexican report to the second Panamerican Conference on Geography and Cartography deals with gravimetry. (1) M. Medina traces the progress of gravity investigations in Mexico from 1866 to the present time, illustrating the results by an isoanomaly map based upon observations at the Mexican stations; the principal zero-anomaly curve is found to follow closely the volcanic axis of Mexico. (2) A. Carreno presents a mathematical derivation of the potential of gravity and the principal formulas for theoretical gravity. He also discusses isostatic-reduction formulas and anomalies, various instruments for gravity determinations, computation of results, and interpretation. (3) R. Toscano gives tables for correction for topography and compensation and discusses the formulas he employed for their computation; these resemble closely Hayford's formulas. (4) An appendix to Carreno's discussion contains C. Becerrill's demonstration of the fundamental theorem of the simple pendulum. (A review of this report appeared in Trans. Am. Geophys. Union, vol. 26, No. 3, 1945, p. 346). - V. S.

8489. The Mining Magazine, London. Craelius Co. issue a Catalogue on Geophysical Surveying. Vol. 74, No. 4, 1946, pp. 246-247.

The essential feature of the Nørgaard gravimeter comprises a nearly horizontal quartz pendulum supported on a horizontal torsion fiber of fused quartz fixed in a quartz frame. This whole system is immersed in a liquid

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and completely enclosed in a thick copper casing. A small glass window is provided in the casing, through which the pendulum may be observed by means of a microscope and a system of mirrors. The casing is protected against outside temperature variations by thick insulation, which eliminates the risk of error due to temperature gradients within the instrument. Observations consist in measuring the angle of displacement from the horizontal of the quartz system about an axis parallel to the torsion fiber when the torque exerted by the pendulum, due to gravity, is balanced by a predetermined torque in the fiber. This angle is measured by micrometer with an accuracy of approximately 0.3 to 0.4 second of arc, which corresponds to an accuracy in gravity determination of about 0.03 to 0.04 mgal. for one observation.

In field work, an accuracy of ±0.014 mgal. has been obtained in the determination of the gravity difference between stations half a mile apart. When referred to one station only, this figure would be 0.01 mgal. The time for setting up, taking observations, and moving out from the station is 4 to 5 minutes. The high speed and accuracy of the instrument and the small need for repetitions at base points are advantages that recommend its use also for commercial geophysical work. - Excerpts from catalogue.

8490. Rankine, A. O., and Evans, P. Geophysical Prospecting for Oil in India. Petroleum Times, London, vol. 50, No. 1,272, 1946, pp. 432-434.

In India, the alluvial regions inaccessible to geological methods have been explored geophysically. Beginning in 1923, the Burma Oil Co. conducted a series of torsion-balance and resistivity surveys in Assam, the Digboi area, and other regions, but found no oil. Then, in 1938, a complete gravity survey of all promising alluvial parts of India and Burma was undertaken, and a local seismic survey was carried out in Assam. Torsion balances and Hol-weck, Ising, and Thyssen gravimeters served for the work; seismic-reflection parties sounded the areas selected for detailed exploration. Exploration continued into 1939, covered 22,000 stations over an area of 330,000 square miles, but had to be suspended because of the war. All the results so far obtained have been negative. However, the gravity data suggest several promising areas; they have a general scientific value in that they establish a connection between the gravity features of India, Burma, and the seas near the Netherlands East Indies investigated by Vening Meinesz. The present plans call for a resumption of exploration. - V. S.

8491. Schiflett, H. L. Quantitative Interpretation of Gravimetric Data (abs.). Oil & Gas Jour., Tulsa, Okla., vol. 44, No. 48, 1946, p. 101.

This paper suggests methods of interpreting gravity data gathered in two widely separated provinces. The first area considered is peninsula Florida, where little seismic and geological information is available. The second area investigated is part of the Permian Basin in west Texas where, over a period of years, considerable geological and other information has been developed. - Author's abs.

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8492. Vening Meinesz, F. A. Fundamental Tables for Regional Isostatic Reduction of Gravity Values. Verh. Kon. Nederlandsche Akad. Wet., Amsterdam, vol. 17, No. 3, 1940, pp. 1-44.

The local isostatic reduction of gravity values adopted in most current tables is based upon the assumption that separate vertical columns of the earth's crust gain isostatic equilibrium independently of one another. This supposition does not correspond to actual conditions, because the strength of the crust prevents a local adjustment. In 1931, the author proposed a method of regional isostatic reduction that avoids these difficulties, and in 1940 he published general tables for such reduction. A summary is presented of the method and formulas employed for the computation of these tables and of the main intermediate stages of the computations. - V. S.

8493. Wen-Po, Weng. Gravitational Data from the Nan Shan Range. Nature, London, vol. 157, No. 3,991, 1946, p. 549.

The study of the gravitational data obtained in the front of the Nan Shan Range, China, reveals interesting facts about the crustal structure of the earth. The variation of the gravitational acceleration was measured by static gravity meters with a sensitivity of 0.1 mg., and the elevation of the stations was determined by a transit to within a few feet. The gravity variation of long linear traverses, after reduction to one common latitude, is plotted separately against the elevation of the stations. The results show that the isostatic compensation and the free air reduction of the elevation fit well in front of the main range. Beyond a sharp boundary, however, the picture changes. Typically, the Bouguer reduction becomes the controlling factor. The data also confirm the current conception that minor land features like the front range, which may be 30 to 70 miles in base and more than 1,500 feet above the surrounding country, is not even slightly compensated in isostasy. Examples are given. - Abridged by V. S.

8494. Wilson, G. M. Diving Chamber Permits Gravity Meter Surveys on Ocean Bottom. Oil Weekly, Houston, Tex., vol. 121, No. 9, 1946, pp. 22-23.

A diving chamber has been developed for gravity surveys under water. This vessel is constructed of 0.5-inch steel plate, measures 5 by 3 feet, and withstands pressure at depths well over 100 feet. It houses an operator, gravity meter, instruments, air-purifying devices, emergency oxygen, test apparatus, and communication facilities. A circular lead weight attached to the bottom provides stability during hoisting and measurements; it can be released in emergencies to allow the vessel to rise to the surface by its own buoyancy. The chamber is operated from a barge carrying a boom and rigging equipment.

Extensive tests conducted recently off the California coast at depths of 25, 35, and 160 feet gave satisfactory results. The chamber will be used for gravity surveys off the Louisiana coast. - V. S.

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2. MAGNETIC METHODS

8495. Afanasieva, V. I. Spherical Harmonic Analysis of the Earth's Magneti Field for Epoch 1945. Terr. Magn. & Atmos. Elect., Baltimore, Md., vol. 51, No. 1, 1946, pp. 19-30.

In 1944, the USSR Institute of Terrestrial Magnetism prepared world magnetic charts for declination, inclination, and horizontal intensity for epoch 1945. They were based on British, American, and Russian data. The Russian material totaled 23,000 magnetic determinations and gave a picture of the USSR considerably different from that found on previous world charts.

In view of this difference, the author makes a new spherical harmonic analysis of the earth's magnetic field, using Schuster's method of development revised by Schmidt. The mathematical derivations are presented, together with tabulations of the results obtained for geomagnetic components, constants, coefficients, etc. The H-data for 1885, 1922, and 1945 show that the earth's moment has decreased during 1922-45 three times slower than during 1885-1922. A comparison of the residual field for 1945 with the residual fields for the preceeding epochs indicates that regional anomalies hold their position on the earth but change in intensity. - V. S.

8496. Baker, G. J. Dimensions and Units of Electromagnetic Quantities. Geophysics, Tulsa, Okla., vol. 11, No. 3, 1946, pp. 373-384.

A brief history is given of the confusion in the literature in regard to c.g.s. electromagnetic units, and some inconsistencies are pointed out. It is contended that most geomagnetic measurements are of the flux density B rather than of H, and that the gamma is correctly regarded as equivalent to 10^{-5} gauss. Dimensions of the important electromagnetic relations between m.k.s. units and electromagnetic and electrostatic c.g.s. units are set forth. The adoption of m.k.s. units is urged, as they are particularly advantageous to engineers. - Author's abs.

8497. Eblé, L. Variation diurne de l'agitation magnétique (Diurnal Variation of Magnetic Disturbance). Ann. Inst. Phys. Globe, Paris, vol. 21, 1943, pp. 88-99.

A previous investigation of diurnal magnetic variation for the period 1917-27 indicated that the disturbance is least in the morning and largest at night, develops earlier during mornings and more strongly at night in the winter, and does not change appreciably from year to year. To verify these conclusions, the observations were continued during 1928-1938. They are tabulated and plotted for annual winter, spring, summer, and fall periods. Statistical analysis covers determination of character figures, frequency of different degrees of disturbance, effects of solar activity, and comparison of methods of observation. The results point to the existence of two independent components in magnetic disturbance. The morning disturbance

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is short, regular, and results from solar action on the ultraviolet radiation. The night disturbance is prolonged, irregular, and results from the combined action of ionized atmosphere and extraterrestrial currents. Magnetic storms form a third group of disturbances. - V. S.

8498. Eckhardt, E. A. The Airborne Magnetometer (abs.). Oil & Gas Jour., Tulsa, Okla., vol. 44, No. 48, 1946, p. 98.

The advent of this new instrument opens up new possibilities in magnetic prospecting. The nature of the information provided by it and the operating advantages it affords are discussed. Discussion of the instrumentation involved will have to be deferred. - Author's abs.

8499. Evrard, Pierre. Les courbes d' anomalies magnétiques horizontale et verticale dues a une couche mince incline (The Curves of Horizontal and Vertical Magnetic Anomalies Caused by a Thin Inclined Layer). Bull. Soc. Roy. Sci. Liege, Belgium, Feb. 18, 1943, pp. 103-108.

The relationship existing between the horizontal and vertical values of magnetic anomalies caused by a thin inclined layer was originally formulated by F. Haalck. Applying simplifying assumptions, the author reduces this relationship to an expression lending itself to simple graphic presentation. The mathematical deductions are given, the method of a simultaneous plotting of horizontal and vertical values is explained, and the resulting curves are illustrated by a drawing.

Two of the equations employed permit checking the precision of the zero level of anomaly curves for every station occupied during a survey. Equations also show that the amplitudes of horizontal and vertical anomalies become equal in the case of identical profiles. As the maximum and the minimum of a curve depend on local conditions and may be determined with different precision, it is essential to make both horizontal and vertical measurements in order to use, if necessary, the maximum of one curve and the minimum of another. - V. S.

8500. Gassmann, F., and Niggli, E. Magnetische Untersuchung von Eisenerzen (Magnetic Analysis of Iron Ores). Verh. Schweizerischen Naturf Ges., Geneva, 1944, pp. 105-106.

The geological interpretation of magnetic anomalies detected by prospecting is made more certain and precise by a knowledge of the magnetic properties of rocks in the region surveyed. To accumulate such information, the Swiss E.T.H. Institut für Geophysik has recently conducted a comprehensive investigation of the ore outcrops in the Alps. Magnetic and petrographic analyses were made of the ore samples collected. The magnetic analyses consisted in determining the susceptibility and the remanent magnetization of oriented cores by magnetic variometers and testing the pulverized ore. - V. S.

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8501. Gebhardt, R. E. An Induction Magnetometer: Construction and Tests. Nat. Res. Council, Trans. Am. Geophys. Union, Washington, D. C., vol. 27, No. 1, 1946, pp. 53-58.

Constructional details and results of tests of an induction magnetometer for measuring all components of the geomagnetic field are discussed. Standardization through preliminary base-line values at the Cheltenham Magnetic Observatory, obtained with the Carnegie Institution of Washington sine-galvanometer, shows only small corrections to the computed constants in all elements. Largest corrections appear in Z and F. If base-line values are obtained by the induction-magnetometer and the magnetograms used only to tie in measurements of different elements, the value of F as observed differs by only two gammas from that computed from the observed values of H and Z. Author's abs. (See also abs. 8508 in this issue. - V. S.)

8502. Hawkes, H. E., and Balsley, J. R. Magnetic Exploration for Iron Ore in Northern New York. U. S. Geological Survey, Washington, D. C., Strategic Minerals Investigations, Prelim. Rep. 3-194, 1946, 9 pp.

In 1945, a magnetic reconnaissance was made in the northern Adirondacks, New York, in quest of iron ore; favorable conditions were sought in predominantly igneous terrain. There followed detailed dip-needle surveys of 50 promising anomalies. The traverses were located on the basis of sun observations, magnetic observations, and airplane photos, depending upon the character of the relief. Base-station measurements served for correcting the readings of the different dip needles employed simultaneously. Ten of the surveys detected iron ore. The newly discovered anomalies are described, their characteristics tabulated, and dip-needle maps appended. - V. S.

8503. Hurwitz, Louis, and Howe, H. H. Magnetic Observatory Results at Tucson, Ariz., for 1937-38. U. S. Coast and Geodetic Survey, Washington, D. C., MO-23, 1944, 102 pp.

This publication contains extensive tables of observatory results, reproductions of magnetograms showing the more important magnetic storms, and an explanatory text. The tabulated results include hourly mean values of the magnetic elements D, H, and Z, summaries of their monthly and annual means, lists of principal magnetic disturbances, amounts of noncyclic change, observed and adopted base-line values of the D, H, and Z variometers with their abrupt changes, etc. The text includes a description of instruments, discussions of their coefficients and behavior and of the procedures used, and explanations of the various tables. - Authors' abs.

8504. Jenny, W. P. Structural Interpretation of Micromagnetic and other Data. Oil Weekly, Houston, Tex., vol. 119, No. 6, 1946, pp. 40-45.

The interpretation of micromagnetic and gravity data is discussed for six surveys in Michigan and the Gulf States. The geological conditions here

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encountered had tested the micromagnetic method on a wide variety of structures, as evidenced by the magnetic isogams and profiles presented.

It is found that interpretation depends, as a rule, upon regional magnetic conditions. Under some conditions, positive micromagnetic anomalies indicate structural highs and under other conditions, structural lows. Certain observations are particularly worth noting: In regions where positive anomalies point to structural highs, a salt uplift may be represented by a negative local anomaly; a very large displacement along a fault may result in a shallow magnetic bed on its downthrown side and none on the upthrown side, with a possible reversion of the magnetic throw. Other observations are given. Various geological conditions are best suited for different geophysical methods, and combined data provide the surest basis for interpretation. - V. S.

8505. Kienow, Sigismund. Erdmagnetische Vermessung der Basaltvorkommen bei Bad Bertrich (Geomagnetic Survey of the Basalt Outcrops near Bad Bertrich). Jahrbuch der Reichsstelle für Bodenforshung, 1939, vol. 60, 1941, pp. 99-117.

In 1937, a magnetic survey was made of the basalt outcrops uncovered by erosion near Bad Bertrich, Mecklenburg. It purported to verify and complete the geological work of I. Ketin. The Askania balance served to measure vertical intensity over stations disposed at an average interval of 30 miles. The precision of measurements is indicated and the theory of magnetic anomalies discussed. The results showed that the magnetic susceptibility of basalt is higher than that of the surrounding tuff and Devonian rock. The basalt outcrops registered high positive values and the neighboring areas, mostly negative values, with maxima of anomalies averaging about 1,000 gammas. As a result, the basalt deposit could be clearly delineated by means of iso-anomalies. Findings are analyzed and interpreted morphologically. - V. S.

8506. Logachev, A. A. The Development and Applications of Airborne Magnetometers in the U.S.S.R. Geophysics, Menasha, Wis., vol. 11, No. 2, 1946, pp. 135-147.

These three papers by A. A. Logachev describe the pioneer work by the Russians in magnetic exploration with airborne equipment. Partly because of the language, and partly because of the obscurity of the journals in which it was published, information on this work has not been widely circulated among American geophysicists. It is hoped that these translations will be of historical if not of practical interest to the profession. - H. E. Hawkes, translator.

The papers in question appeared in Russian journals in 1936, 1937, and 1940. Abstracts of them will be found in Geoph. Abs. 87, No. 3282; G. A. 90, No. 3832; and G. A. 102, No. 5618. - V. S.

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8507. Magnée, I. de. Les methodes d'exploration géophysiques et le laboratoire de géologie (Geophysical Methods of Exploration and the Geological Laboratory). Bull. Soc. Belge Géol., Paleont. & Hydrol., Brussels, vol. 53, No. 3, 1945, pp. 199-228.

Some of the methods of geophysical exploration are so simple and cheap that they can be used by geologists without special preparation. Particularly adequate for such purpose are the magnetic method and various electrical methods, all suitable for metals exploration. To overcome existing prejudices and bring about broad acceptance and application, the author outlines these methods with respect to principles, instruments, and field techniques. For magnetic surveys, he suggests the balance of Ad. Schmidt; for electrical surveys, the equipotential, resistivity, and sounding methods. Concrete examples of exploration illustrate the discussion. The current techniques of such exploration are now so improved and standardized that the geological divisions of industrial companies and the departments of universities may well include them among their routine tools. - V. S.

8508. McNish, A. G. An Induction Magnetometer: Principle of Operation. Trans. Am. Geophys. Union, Washington, D. C., vol. 27, No. 1, 1946, pp. 49-51.

A simple form of saturated-core induction-type magnetometer is described, and the principle of its operation is briefly discussed. This version of the instrument employs no electronic components. Possibility of its application as a universal instrument for geomagnetic measurements is suggested. - Author's abs.

8509. Modriniak, N. Geophysical Investigations and Drilling Results East of Karapiro Dam. New Zealand Jour. Sci. Tech., Wellington, vol. 27, No. 3 B, 1945, pp. 218-223.

Results of magnetic and seismic observations are shown on the maps and briefly discussed. Positions of bores are shown, logs tabulated, and important implications pointed out. Trenches indicate that the depressions on the pumice terrace east of Karapiro Dam are probably of Maori origin. - Author's abs.

8510. Morelli, C. Misure magnetiche in Albania (Magnetic Measurements in Albania). Geofis. Pura & Appl., Messina, vol. 6, Nos. 1-2, 1944, pp. 1-2, 14-22.

The Italian Military Geographical Institute has made magnetic surveys in Albania. Absolute values D, H, and I were measured at 65 stations disposed at about 20 km. one from another. They revealed two zones of extensive anomalies in northern and southeastern Albania caused by eruptive rocks of the Eocene. Moreover, three pronounced regional anomalies were noted in the general region of Scutary, Kruja, Korcia, and Valona; two of them are

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apparently due to basic rocks at a depth of several kilometers. The results of the survey have been embodied in a magnetic map drawn on a scale of 1: 750,000, with isolines for 1942.0. - V. S.

8511. Nelson, J. H., and Campbell, J. B. Additional Data on the Spontaneous Increase of Magnetic Moment. Trans. Am. Geophys. Union, Washington, D. C., vol. 26, No. 3, 1945, pp. 379-380.

The long cobalt-steel magnet of the Cooke-type magnetometer in use at the Tucson Magnetic Observatory since 1940 has shown an increase of moment since 1943 (Geophys. Abs. 116, No. 7270). The observations and curves reported at that time pointed to a relation between the residual seasonal change of the moment and seasonal temperatures. Additional data gathered since then are now presented in the form of observed and adjusted graphs. The curve of the Log M_{20} (adjusted) shows that the increase of magnetic moment was greater during 1939-40 than during 1941-42. This decline enables the authors to predict that the moment will cease to increase within the next 2 to 3 years. The temperature curve stands in a changing phase-relation to the magnet's curve and points to an error in the temperature coefficient of the magnet, not in excess of 3 percent. The procedures of magnetic and thermal observations are indicated and the data discussed. - V. S.

8512. Nicholson, G. B. Airborne Magnetometer Expedites Geophysical Surveys. Oil Weekly, Houston, Tex., vol. 122, No. 1, 1946, pp. 29-32.

During the war, several laboratories in the United States developed airborne magnetometers for submarine detection. The magnetometer here described is the U. S. Naval Ordnance and Bell Telephone model adapted for geophysical exploration with the assistance of the U. S. Geological Survey and other agencies. It is made highly sensitive to magnetic bodies by special fluxgates responding to anomalies of an intensity as low as one gamma. Detection is accomplished by an electronic recorder of the magnetic field and a strip camera photographing location; both are operated continuously.

The entire detector apparatus is housed in a bomb-shaped, streamlined capsule made of nonmagnetic plywood, measuring 6 feet in length and weighing 350 pounds. It is either trailed behind a twin-engine plane on an electric tow cable 100 feet long or mounted in a special extension from the tail section. The head of the capsule houses a gimbal mechanism orienting the magnetometer in flight. A radio altimeter in the plane's cabin makes it possible to fly at a height of about 1,000 feet so as not to exceed the range of the magnetic sensitivity of the fluxgate detector. The magnetic readings and corresponding ground locations eventually are plotted in the form of an isogam contour map.

The Geological Survey and the Navy conducted numerous test flights over regions known to contain iron and oil in Pennsylvania, Michigan, Oklahoma, Wyoming, Maryland, New York, Alaska, and over the continental shelf of the Gulf of Mexico and obtained satisfactory results. Certain techniques as to

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the spacing of traverses, speed and altitude of flight, etc., are being developed. An airborne magnetometer survey has been 17 times cheaper than a ground reconnaissance survey with a dip needle. It has been 150 times as fast in the Adirondacks mountains. (See also abs. 8619 in this issue.) - V. S.

8513. Omer, G. C., Jr. Seismic Areas and Secular Magnetic Variations. Bull. Seism. Soc. America, Berkeley, Calif., vol. 36, No. 1, 1946, pp. 21-29.

A good geographical coincidence is observed to exist between areas of anomalous change in the earth's secular magnetic field and the western Indian Ocean, the mid-Atlantic Ridge, and the Easter Island Ridge seismic zones. Suggestive relationships are noted between changes in the earth's secular magnetic field and other areas of shallow seismicity. - Author's abs

8514. Rougerie, Paul. Contribution a l'etude des courants telluriques (Contribution to the Study of Telluric Currents). Ann. Inst. Phys. Globe, Paris, vol. 20, 1942, pp. 60-104.

The correspondence observed between magnetic and telluric variations has lead to the hypothesis that geomagnetic fluctuations are caused by telluric currents. To verify such possibility, the author made a study of diurnal telluric variation measured at the Observatoire du Parc Saint-Maur during 1893-98 near Paris. The data on the average hourly differences in registered potential and the derived indices are tabulated and plotted. Consideration is given to harmonic and vector analysis of diurnal telluric variation, direction of current, comparison of the harmonics of variation of the magnetic declination and the meridian telluric component, theoretical induction and telluric currents, etc. The components of the telluric current have the average values: N = 1.04 mv./Km. and E = -0.83 mv./Km.

The results show a coincident variation of the horizontal magnetic component H and the telluric component E, and of the magnetic declination D and the telluric component N; an increase in electromotive force toward N-E corresponds to a decrease in both magnetic elements. The indications are that telluric and magnetic variations have a common cause and that their mutual relation is complex. There is, however, no proof of a cause-effect dependence between them. The paper is supplied with bibliography. - V. S.

8515. Scott, W. E. American Magnetic Character-Figure, C_A, Three-Hour-Range Indices, K, and Mean K-Indices, K_A, for October to December 1945 and Summary for Year 1945. Terr. Magn. & Atmos. Elect., Baltimore, Md vol. 51, No. 1, 1946, pp. 57-66.

Tables and diagrams of magnetic character-figures are given with explanatory text. The minimum of magnetic activity for the current sunspot-cycle was reached during June to November 1945. There were no magnetic

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disturbances during May, June, July, and August 1945, and the few storms that occurred were distributed about equally in the winter and equinoctial months. Quiescent periods persisted for many solar rotations. - V. S.

8516. Swainson, O. W. Magnetic Work of the United States Coast and Geodetic Survey from April 1944 through March 1945. Trans. Am. Geophys. Union, Washington, D. C., vol. 26, No. 3, 1945, pp. 447-450.

During the year 1944-45, the Section of Geomagnetism, U. S. Coast and Geodetic Survey, carried on magnetic surveys and related work largely for the use of the military services. The magnetic surveys were made in the United States, Brazil, Chile, Costa Rica, Galapagos Islands, Guatemala, Honduras, Mexico, Nicaragua, Panama, and Peru, extending as far south as Punta Arenas on the Straits of Magellan; they consisted mainly of repeat observations for the compilation of charts. In the United States, the work on the 1945 isomagnetic charts begun in 1943 was completed, occupying in all 200 stations. In Alaska, a partial repeat survey gave valuable information on secular change. The year's observations are tabulated. The data obtained were disseminated, instruments were developed, publications were prepared and published, and observatory operations were continued. - V. S.

8517. Wall, T. F. The Mechanism of Magnetization. Pts. 1-4. Engineer, London, March 22-29, April 5-12, 1940, pp. 273-276, 294-297, 318-320, 342-344.

Magnetization of steels and alloys affects their properties and plays a role in many problems, among them the precision of scientific instruments. The entire phenomenon has been extensively studied, but the formulation of results is very incomplete. To aid the practical application of accumulated knowledge, the author presents a concise theory of magnetization largely reduced to mathematical expression. It covers the characteristics of magnetization, self-demagnetization, influence of temperature, magnetostriction, remanence, initial permeability, coercive force, and the effects of surface treatment. - V. S.

3. SEISMIC METHODS

8518. Bernard, Pierre. Etude sur l'agitation microseismique et ses variations (A Study of Microseismic Disturbance and its Variation). Ann. Inst. Phys. Globe, Paris, vol. 19, 1941, pp. 1-77.

In addition to seismic waves proper, seismograms show other types of vibration. Among the latter, the most common and articulate is the microseismic disturbance. Its nature and variation have been examined by the author with the use of observations made at stations in different parts of the world, mainly during 1923-35. The method consisted in studying a strong microseismic storm with brisk commencement, comparing microseismic

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disturbance with the average swell on the coast of Morocco, determining annual microseismic variation, and analyzing the influence of the sun. The data obtained are presented in tables, curves, and maps.

The evidence shows that the average annual variation of the microseismic disturbance parallels that of cyclones and has a periodicity of 11 and 27 days, corresponding to the periodicity of sun spots. The mechanical cause of microseismic disturbance in Europe, apparently, is located in the central zone of atmospheric depressions. - V. S.

8519. Bodle, R. R. United States Earthquakes 1943. U. S. Coast and Geodet. Surv., Washington, D. C., No. 672, 1945, 49 pp.

A summary is given of earthquake activity in the United States and its possessions during 1943. It covers noninstrumental results for the various States, seismological observatory results, strong motion observations, tilt data, and related information; maps and records illustrate the text. The section on strong motion presents an analysis of seismograph records, the program being carried out to obtain data for the design of earthquake-resisting structures; the material includes tracings of accelerograph records and notes on changes in the construction of strong-motion instruments. - V.

8520. Bucky, P. B., et al. Rock Bursts: A Symposium. Am. Inst. Min. Met. Eng., New York, N. Y., Tech. Pub. 1468, 1942, 56 pp.

A symposium on rockburst is presented by authors from different parts of the world. It deals with the nature, causes, prevention, prediction, and control of this phenomenon. Some 60 statements are assembled covering theory, methodology, practice, criticism, etc. They are regarded timely in view of recent evidence challenging some of the basic conceptions of rockburst, particularly those concerning the role of depth. - V. S.

8521. Bullen, K. E. Features of the Travel-Time Curves of Seismic Rays. Mon. Notes, Roy. Astr. Soc., London, Geophys. Suppl., vol. 5, No. 4, 1945, pp. 91-98.

A method is given of deriving the main features of the seismological travel-time tables from various assumed forms of the ray velocity variation. Attention is drawn to the utility of the functions $d\varphi/dp$ and ζ in this connection. Attention is also drawn to the utility of the approximate formula $v = ar^b$, which is both simple in application and gives very accurate results in parts of the earth's interior, notably the region between the crustal layers and the level reached by rays for which $\Delta = 20^\circ$. - Author's abs.

8522. Carder, D. S. Seismic Investigations in the Boulder Dam Area, 1940-44, and the Influence of Reservoir Loading on Local Earthquake Activity. Bull. Seism. Soc. America, Berkeley, Calif., vol. 35, No. 4, 1946, pp. 175-194.

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Since the reservoir behind Boulder Dam started to fill in 1935, several hundred small earthquakes have been felt in the adjacent area, and several thousand have been recorded since the first seismograph was installed at Boulder City early in 1938. Epicenters of several hundred of the latter have been located, in large part along known or suspected faults on the southern margins of the large lower basin in the reservoir. It is believed that the crustal block upon which this section of the reservoir rests has been tilted downward several inches along these faults, and that the granitic massif south of the faults has not partaken in the downward movement. It is known that settlement of areas of sedimentary and volcanic rocks near the lake is somewhat greater than in similar areas of granitic rock. It is believed that this settlement is the cause of large numbers of the local shocks, partly because the peak occurrence-distribution is usually associated with peak seasonal loads in the reservoir. - Author's abs., Trans. Am. Geophys. Union, vol. 26, No. 2, 1945, p. 203.

8523. Choate, B. M., and Clifford, O. C., Jr. Seismic Surveys of Neale Field, Beauregard Parish, Louisiana (abs.). Oil & Gas Jour., Tulsa, Okla., vol. 44, No. 48, 1946, p. 98.

Reflection-seismic exploration of an area in Beauregard Parish, Louisiana, was initiated in February 1938, and was first completed in October 1938. As a result of shallow structural determination, a test well (dry) was bored. This test was followed by additional seismic work, which showed the position of the structure shifted with depth and resulted in the completion of the discovery well in March 1940. Additional seismic data were added at various times, and the area of probable structural closure, to depths in excess of 11,000 feet, was eventually considered evaluated by the method in October 1944. - Author's abs.

8524. Christie, N. J. Seismograph Exploration in England, 1944 and 1945. Mines Mag., Denver, Colo., vol. 36, No. 1, 1946, pp. 27-30.

A seismograph party of the United Geophysical Co. prospected for oil in England during 1943-45. The work was done in the area of the recently discovered Eakring field, Nottingham, east of the Pennine Range. The local beds of the Milstone Grit series yielding the oil are fairly large and suitable for seismic exploration. They had been explored by the Anglo-Iranian Oil Co. in 1937-38, and the American crew employed reflection shooting for detailed work.

Single ender-spreads of about 1,000 to 2,000 feet were used to cover the area, and computations were generally made on end traces. In eastern Yorkshire, every trace had to be computed because of the deep peat ground; though the geophones were buried, the poor quality of reflections did not improve. In all, the character of records was found to change considerably over short distances and different depths. The American crew also made well-velocity surveys, the first in England, to check discrepancies with local logs and establish a velocity gradient for the area. The results of the surveys in the different districts are described. They point to several promising structures. - V. S.

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8525. Finch, R. H. On the Depth of Foci of Earthquakes on the Island of Hawaii. Volcano Letter, University of Hawaii, Hawaii National Park, No. 490, 1945, pp. 1-2.

Seismic observations have shown that the depth of earthquake foci on the island of Hawaii ranges from near surface to 30 miles. The shocks originate in three principal types of fault systems; namely, the fundamental rift of the island, comparatively superficial faults within the volcanic structures, and volcanic conduits. The shallow shocks along the Mauna Loa and Kilauea rifts may have foci above sea level, and their wave path may lie partly in dry, partly in water-saturated ground; as the velocity of waves is less in saturated than in dry rock, the impression of a discontinuity is then produced at the ground-water level. The deep and strong shock of December 27, 1944, which dismantled all the seismographs on the island, occurred about 20 miles below the eastern slope of Mauna Loa; it was felt 200 miles away and had at least 10 or 12 aftershocks. Other earthquakes are mentioned, and the related fault systems are discussed. - V. S.

8526. Frank, A. J. The Earthquake of March 27, 1945, on the Moselle (Missouri) Fault. Trans. Am. Geophys. Union, Washington, D. C., vol. 26, No. 3, 1945, pp. 347-351.

The study of the earthquake centering near Moselle, Missouri, opens up for research a heretofore unnoticed region of seismic activity. The macroseismic data of this earthquake, summarized in the form of an isoseismal map, agree with the interpretation of the seismograms. A geologic survey made in the epicentral region delineates the fault along which both the instrumental and macroseismic results placed the epicenter. A study of the hypocentral depth shows that this fault system might extend to a depth where some have denied faulting. Thus, the earthquake gives a hint of structure. - Author's abs.

8527. Gardner, L. W. Vertical Velocities From Reflection Shooting (abs.). Oil & Gas Jour., Tulsa, Okla., vol. 44, No. 48, 1946, p. 98.

A method of determining vertical velocities from reflection shooting is described. A special array of spreads is used, by means of which (1) surface correlations are canceled or minimized and (2) common center points for pairs of long and short setups are used to minimize errors in the determination of angularity corrections. Examples are given in which velocities determined by this method are compared with those obtained from well shooting. - Author's abs.

8528. Gutenberg, B., and Richter, C. F. Earthquake Study in Souther California, 1944. Trans. Am. Geophys. Union, Washington, D. C., vol. 26, No. 2, 1945, pp. 313-314.

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Additional observations and results of calculations are given in amplification of the 16 seismological studies of earthquakes in Southern California published in 1943-45 by B. Gutenberg, C. F. Richter, S. W. Dana, C. Y. Fu, and J. M. Nordquist. (See Geoph. Abs. 112-123, 1943-45.) - V. S.

8529. Hayes, R. C. Earthquakes in New Zealand During the Year 1944. New Zealand Jour. Sci. Techn., Wellington, N. Z., vol. 27B, No. 1, 1945, pp. 33-35.

Maps are presented showing the epicenters of the principal earthquakes in the New Zealand region during 1944 and the approximate isoseismals of two of the strongest shocks. The date, time, and maximal felt intensity of the mapped earthquakes are tabulated, and the accuracies of epicentre determination are indicated on the map. - V. S.

8530. Ivanhoe, L. F. Geophysical Crews Lick the Jungles. Oil Weekly, Houston, Tex., vol. 121, No. 1, 1946, Internat. Sec., pp. 20-22.

The Seismograph Service of Delaware is carrying on extensive geophysical exploration for oil in South America. Twelve parties have worked recently in Venezuela. The author reports on the conditions encountered by them in the virgin jungle. The chief difficulties arise from a lack of transportation, which forces the crews to be self-sufficient. They must build roads, feed and shelter personnel, provide medical attention, decide legal questions, haul and store supplies and gasoline, pay laborers in cash, repair electric installations and trucks, etc., in order to carry on surveying, shooting, computing, and drilling. The accommodations of a tent camp in the jungle are described. - V. S.

8531. Kreis, Alfred. Seismische Sondierungen auf dem Morteratschgletscher (Seismic Surveys on the Morteratsch Glacier). Verh. Schweizerischen Naturf. Ges., Geneva, 1944, p. 95.

The Glacier Commission of the Swiss Society of Natural Sciences (S.N.G.) resumed in 1943 its seismic measurements of glacier thickness interrupted by the war. A survey was made of the Morteratsch glacier, which offers several glaciological problems. Three stations were occupied. The first, on moraine debris 150 m. below the glacier, gave a P-wave velocity of 1,600 m./sec. in the 10-meter thickness of the fluvioglacial deposits of the glacier measured by seismic refraction; in the rock beneath, the velocity was 4,300 m./sec. The second station, on the lower part on the glacier, gave a P-velocity of 3,650 m./sec. in the 70-100 meter thickness of the ice measured by seismic reflection. Finally, the third station, on the upper part of the glacier, showed the greatest thickness of the ice to be 360 m., with deep rock close beneath it. Limited time handicapped exploration from this station. - V. S.

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8532. Lees, G. M. Oilfields in Great Britain. Nature, London, vol. 155, No. 3941, 1945, pp. 567-568.

The article stresses the part played by geophysics, particularly the seismic reflection method, in locating further oil supplies. - Dominion Observatory, Ottawa, Bibliography of Seismology, No. 18, 1945, p. 302.

8533. Macelwane, J. B. Progress Report of the Jesuit Seismological Association for 1944. Trans. Am. Geophys. Union, Washington, D. C., vol. 26, No. 2, 1945, pp. 315-316.

Epicentral locations, focal depths, and related information are presented for 48 earthquakes of the year 1944. The determinations are based upon the seismic observations of Jesuit and cooperating stations. Thirteen of the earthquakes, all in the Pacific and adjacent areas, were deeper than normal. One shock near the Kermadec Islands had a focal depth of the order of 600 km. The total material for 1944 is published in the Preliminary Bulletins on Epicenters, issued by the Central Jesuit Station in Saint Louis, Mo. - V. S.

8534. Martin, R. Oscilacion de suelos no elasticos (Oscillation of Unelastic Soils). Bol. Inform. Petrol., Buenos Aires, vol. 22, No. 254, 1945, pp. 256-259.

The propagation of longitudinal and transverse waves in the ground is discussed in its dependence on the elastic constants of the layers traversed the effects of the elasticity of materials upon the extinction of vibrations are expressed mathematically. The various types of heterogeneous and unelastic ground complicate the problem. When they are reached by seismic waves propagated from elastic layers, they react as centers of new vibrations and loci of secondary epicenters, so that the total ground is subject to various waves from numerous epicenters. This phenomenon has been recognized theoretically but has not been demonstrated. The author describes and discusses seismic data obtained in 1942 in the province of Mendoza, which show unquestionable evidence of the different types of vibrations in question. Samples of seismograms are reproduced. - V. S.

8535. Matthews, T. H. An Elementary Proof of a Theorem in Geophysics. Trans. Roy. Soc. Canada, Ottawa, 3d ser., vol. 39, No. 3, 1945, pp. 21-23.

A mathematical demonstration is given showing that, in cases when velocity of propagation increases linearly with depth, the quickest wave path between two points on a surface is the arc of a circle in a vertical plane through these points. In two dimensions, the wave front of a disturbance starting at a given point is a circle of the orthogonal system, which has for its radical axis a fixed line through the center of the circle. In three dimensions, the wave front is a sphere belonging to a coaxial system.

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It is obtained in the latter case by rotating the circle about an axis drawn between the point and its image in the fixed line through the center of the circle. - V. S.

8536. McCarver, H. C., and West, L. G. Geology and Geophysics of the Odem Oil Field, San Patricio County, Texas (abs.). Oil & Gas Jour., Tulsa, Okla., vol. 44, No. 48, 1946, p. 97.

This paper discusses the successive steps in geological and geophysical exploration that led to the discovery of the Odem field. The original seismograph maps are presented, showing the discovery of structure in an area apparently condemned by dry holes. The remarkably close relationship of seismograph structure to areas subsequently proven productive is illustrated. A geological structure map is presented; also a cross section comparing seismic and well data. - Authors' abs.

Modriniak, N. Geophysical Investigations and Drilling Results East of Karapiro Dam. New Zealand Jour. Sci. Tech., Wellington, vol. 27, No. 3, 1945, pp. 218-223 (see abs. 8509 in this issue).

8537. Neumann, F. Progress Report on Seismological Activity of the United States Coast and Geodetic Survey, 1944-45. Trans. Am. Geophys. Union, Washington, D. C., vol. 26, No. 3, 1945, pp. 441-443.

The U. S. Coast and Geodetic Survey carried out its seismological program for 1944-45 without serious interruption. (1) Teleseismic work included publication of results for 24 stations, instrumental activities, tests of sites for stations, a special investigation of Lake Mead-area earthquakes, etc. (2) Information service on earthquakes in the western mountain region and on the Pacific coast was maintained. (3) Strong-motion registration continued, mostly on the Pacific coast; the application of torsion-pendulum analysis to accelerograph records received considerable attention in connection with earthquake-resistant structures. (4) Vibration work was conducted at Grand Coulee dam and Ross dam to investigate the effects of falling water and tunnel blasting, respectively. (5) Instruments were constructed, tested, improved, special projects executed, investigations continued, and publications issued. - V. S.

8538. Neumann, L. J. Multiple Refraction Shooting in Southern Florida (abs.). Oil & Gas Jour., Tulsa, Okla., vol. 44, No. 48, 1946, p. 98-101.

In the multiple-refraction method, the first arrivals of energy of several refracted events are recorded on a single oscillogram. Each of the refracted events usually possesses enough character to enable the interpreter to correlate these events for many miles in southern Florida. The subsurface

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can be profiled continuously. Such refracted events were recorded from several limestones and the crystalline dolomite. This procedure enables one to determine the velocities, depths, intervals, and dips of these geological horizons. The use of n-th order refractions would enable one to determine velocities and dips, but not accurately to determine the depths and intervals. Velocities of the formations down to 2,000 feet or more are very variable in southern Florida. This precludes the possibility of using the ordinary reflection method with any great accuracy, even though reflections may be recorded. - Author's abs.

8539. Oil Weekly. A Seismograph Crew on the Mississippi. Houston, Tex., vol. 121, No. 1, 1946, pp. 18-21.

Seismograph crews working on isolated coastal areas of the Gulf of Mexico will have their living quarters on a houseboat now anchored at the mouth of the Mississippi River. The boat has been constructed by the Gulf Research & Development Co. and houses 40 persons. The technical equipment and living accommodations are described. - V. S.

Omer, G. C., Jr. Seismic Areas and Secular Magnetic Variations. Bull. Seism. Soc. America, Berkeley, Calif., vol. 36, No. 1, 1946, pp. 21-29. (See abs. 8513 in this issue.)

8540. Rosenzweig, Alfredo. Bibliografia sismologica del Peru (Seismological Bibliography of Peru). Instituto Geologico del Peru, Lima, Bol. 2, 1945, 26 pp.

This bibliography contains 223 entries covering the period 1582-1944. It is published in Spanish, English, German, and French. - V. S.

8541. Robertson, Florence. On the Problem of Ground Motion. Bull. Seism. Soc. America, Berkeley, Calif., vol. 36, No. 1, 1946, pp. 17-20.

The difficulty of determining the motion of the earth from a seismogram is that the axis of oscillation of the seismogram-trace is unknown. Galitzin has assumed in his equation for an electromagnetic seismograph that the trace-amplitudes are read in the general case with respect to some arbitrary time axis expressed mathematically. The error of this approximation is cumulative because of the threefold integration employed.

The author derives a new equation for earth displacement from the Galitzin formula by making simplifying assumptions. Her calculations show that the displacement is proportional to the trace-amplitudes of the seismogram. Accordingly, for simple harmonic motion the graph of the earth displacement becomes the graph of the seismogram trace multiplied by the amplitude-proportionality factor and displaced parallel to the time axis by the amount required by the phase angle. This equation has been shown to be

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approximately valid for the pseudoharmonic motion of microseisms recorded by the Florissant Galitzin-Wilip seismograph. - V. S.

8542. Scott, H. H. An Analyzer for Sub-Audible Frequencies. Jour. Acoust. Soc. America, Lancaster, Pa., vol. 13, No. 4, 1942, pp. 360-362.

A report on this useful tool is given in General Radio Experimenter, vol. 20, Nos. 6-7, pp. 3-7, Cambridge, Mass., Nov.-Dec., 1945. The list price of the instrument is quoted at $275. The frequency range covered is 2.5 to 750 cps. - Dominion Observatory, Ottawa, Bibliography of Seismology, No. 18, 1945, p. 310.

8543. Seismograph Service Corporation of Delaware. South American Oil Zones, pt. 2. Petroleo Interamericano, Tulsa, Okla., vol. 2, No. 5, 1945, pp. 87-98.

The chief deterrent to South American prospecting for oil is unfavorable local geology. Great thicknesses of continental deposits cover much of the area and render ill-accessible many structures that might produce from the later Mesozoic and Tertiary formations. Below them is the Gondwana series of thick glacial deposits concealing the Paleozoic possibilities. Therefore, oil discovery depends largely on the deep-sounding geophysical methods.

To further such exploration, the depositions of the major sedimentary systems of Central and South America are discussed and illustrated by geological maps. Consideration is given to Devonian, Permo-Carboniferous, Mesozoic, Eocene-Oligocene, and Miocene-Pliocene sediments as contained in the Brazilian-Guiana shield, Gondwanaland, Circum-Gondwana, the Andes, Inter-Andean embayments, and the coastal plain. The areas favorable for oil and gas prospecting are indicated and shown on the maps. (For Part 1, see Geoph. Abs. 120, No. 7844.) - V. S.

8544. Silgado, E. F. Datos Sismologicos del Peru (Seismological Data of Peru). Instituto Geologico del Peru, Lima, Boletin No. 3, 1946, 42 pp.

The information presented covers the seismological activities of the Geological Institute of Peru, statistics and maps on the earthquakes registered by its Geophysical Section during 1945, and a detailed description of the destructive earthquake of August 6, 1945, in Moyobamba. In all, there were 129 distinct shocks during February-December, mostly of intensity III-IV, Mercalli Scale 1931. - V. S.

8545. Sloat, John. Is the Seismograph Still Champion? Oil Weekly, Houston, Tex., vol. 120, No. 10, 1946, pp. 17-22.

During 1945, over thirty million dollars have been expended by oil companies in the United States on seismograph exploration. The question as to

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whether the best possible use is made of this method is examined in the light of the principles of seismic exploration.

There are only two physical quantities that can be measured directly with the seismograph - surface distance and time. In order to utilize this information, it is necessary to convert travel time to underground dip and depth. This is accomplished by making assumptions on the velocity of propagation of the sound wave and computing the corresponding depth and dip of the reflected wave. However, many beds do not give consistent reflections on seismograms, so that seismograph records actually depend on velocity contrasts. Interpretation is thereby complicated because variation of velocity with different subsurface conditions renders the use of average velocity hazardous. Concrete examples are given, implications are worked out for structural and stratigraphic traps, and remedies are suggested. Cross sections and seismograms illustrate the text. - V. S.

8546. Ulrich, F. P. Progress Report of Seismological Work by the U. S. Coast and Geodetic Survey in the Western United States During 1944. Bull. Seism. Soc. America, Berkeley, Calif., vol. 36, No. 1, 1946, pp. 31-41.

The seismological work of the U. S. Coast and Geodetic Survey in the western United States during 1944 has consisted of the following activities: (1) The questionnaire program collected reports of 290 earthquakes; 25 of them, rated in intensity V or greater, are described and shown on maps. (2) The strong-motion work was carried out by means of 44 accelerographs, 6 displacement meters, 11 Weed strong-motion seismographs, 1 mechanical vibration recorder, and 3 tiltmeters. (3) Tiltmeter registration went on continuously throughout the year; the tiltgrams are shown. (4) Vibration observations were made on buildings and dams, particularly on Ross Dam, Seattle. The other activities of the Survey dealt with instruments, selection of sites for installations, publication of reports, epicentral determination, rock vibration due to blasting, and a cooperative seismological program for the western hemisphere. - V. S.

8547. Williams, F. J. Notes on Shot-Point Procedure (abs.). Oil & Gas Jour., Tulsa, Okla., vol. 44, No. 48, 1946, p. 101.

Some characteristics of seismic explosives are reviewed, and an attemp is made to outline optimum shot-point procedure from the standpoint of efficiency and quality of data. Care in preparation of charges is stressed, with special emphasis on cap placement and charge assembly. The time-current relations of a specific seismic cap are given, and the effect of the resistance of the firing circuit upon detonation time is discussed. Suggestions are made in regard to the choice of the favorable location for the up-hole time seismometer. It is concluded that adherence to well-defined specific shot-point procedure is essential to the efficient procurement of highest-quality recordings. - Author's abs.

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4. ELECTRICAL METHODS

8548. Fisher, G. R. Geophysical Prospecting for the Layman. Fisher Research Laboratory, Palo Alto, Calif., 1946, 47 pp.

A brief outline is given of the seismic, gravitational, magnetic, and radioactive methods of geophysical exploration. Attention is then devoted to the electrical methods of natural earth potential, applied current (parallel wire, polar electrode, leap frog, earth resistivity), and induced current (parallel wire, horizontal loop, vertical loop). The different factors affecting electrical methods, such as the characteristics of the conductors, conducting body, and surrounding formations, are considered. As an example of inductive exploration for metals, prospecting with the Metallascope is described. Principles of operation, models of the apparatus, and field techniques are outlined and illustrated by drawings. - V. S.

8549. Lannuzel, J., and Souchon, E. Electric Logs: How Affected by Mud Invasion into Formation. Petroleo Interamericano, Tulsa, Okla., vol. 4, No. 4, 1946, pp. 56-60.

Mud invasion into a permeable formation opened by drilling decreases the spontaneous potentials measured by an electric log and can lead to erroneous interpretation. Such invasion forms several layers in the walls of a hole: Mud cake, zone contaminated by mud, and zone contaminated by mud filtrate. The filtrate zone may be removed several feet from the wall, and usually it has a different resistivity from that of the uncontaminated formation. Since a resistivity log measures only a short distance behind the wall, it will record the resistivity of the invaded zone. To overcome this difficulty, the devices of long-normal or lateral sounding may be employed. They aim to reach beyond the influence of the mud by making use of the dependence of a log's radius of investigation upon the spacing of electrodes. The problems involved are discussed. - V. S.

8550. Lewis, W. B. Let Us Look at Electrical Exploration. Oil Weekly, Houston, Tex., vol. 118, No. 11, 1945, pp. 57-58.

The propagation of electromagnetic waves through the air and the ground is compared. The ground has a greater absorptive and dispersive effect upon the waves and reduces their speed; moreover, different horizons vary in reflecting capacity according to their resistivity. Inasmuch as petroleum has a high electrical resistivity, it changes the character of reflections passing from less resistive horizons and registers as an anomaly in the record.

These factors explain what electromagnetic waves must be used in oil exploration and how they must be used. Low-frequency waves are sent into the ground by means of a periodically reversed current passed through two grounded electrodes; the alternating potential is measured at several different frequencies. The effects of current are observed in terms of the potential between two probe electrodes suitably disposed relatively to

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the current electrodes. The entire electrode pattern should answer the conditions of the area explored. Such a procedure is repeated at a number of stations distributed over the area. The method has proved effective, rapid, and economical. Its advantage lies in the fact that it identifies petroleum by means of its electrical properties rather than by associated structure. - V. S.

Magnée, I. de. Les methodes d'exploration géophysiques et le laboratoire de géologie (Geophysical Methods of Exploration and the Geological Laboratory). Bull. Soc. Belge Géol., Paleont., & Hydrol., Brussels, vol. 53, No. 3, 1945, pp. 199-228. (See abs. 8507 in this issue.)

8551. Paver, G. L. The Application of the Electrical Resistivity Method of Geophysical Surveying to the Location of Underground Water, with Examples from the Middle East (abs.). Abstracts, Proc. Geol. Soc. London, Sess. 1944-45, No. 1407-15, 1945, pp. 56-61.

Geophysical surveys of underground water usually employ the electrical resistivity method. It approaches direct localization closer than other methods, requires a short time, and costs relatively little. The data gained indicate the variations of the substrata both vertically and horizontally. The method's technical problems, instruments, field practices, calculations, graphs, and interpretation are discussed. The profitableness of resistivity exploration is illustrated by examples of surveys in Egypt, Sinai, Palestine, Trans-Jordan, Syria, and Cyprus; some local problems and results are cited. V. S.

8552. Storm, Barry. Geophysical Prospecting Methods. Min. Jour., Phoenix, Ariz., vol. 29, 1946, No. 21, pp. 3-4, No. 22, pp. 5-7.

A lone prospector for metals can no longer depend on his intuition but must adopt scientific methods. Most suitable for his purpose is the electrical method. Its principles are outlined and the techniques of surface potential, applied current, and electric induction explained.

The use of the last-named technique is further illustrated by the example of prospecting with a Fisher's radionic Metallascope. This apparatus consists of two units - a transmitter and a receiver. The transmitter establishes a primary electro-magnetic field in the earth which affects the receiver only when a conductive body is located in the subsurface nearby, within the range of the downward radiation. A secondary field of opposite polarity is then induced, which distorts or broadens the original field and thus energizes the receiver's radio-finder circuit. The differences in electrical radiation caused by the conductive body register on the receiver milliampere dial and in an earphone.

There are several models of the M-Scope - a light portable mounting both transmitter and receiver on a single frame, and a heavier portable in which the units are used as separate instruments. The model and the field method to be employed in any particular case depend on the depth range and

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degree of mineralization investigated. The "balanced," "null or minimum reception," and "parallel or positive" methods are described, their applications discussed, and instructions for using a depth-triangulation chart given. - V. S.

8553. Workman, L. E., Bays, C. A., and Buhle, M. B. The Use of Electrical Earth Resistivity Surveys in Illinois (abs.). Econ. Geol., Lancaster, Pa., vol. 40, No. 8, 1945, pp. 610-611.

For nearly 15 years the electrical earth-resistivity method has been used in Illinois to guide test drilling in the search for water-bearing sands and gravels in the glacial drift. During this period, many areas in the State have been surveyed, and many municipal and industrial water supplies have been found and developed very economically as a result of this work.

Portable instruments are employed by the Illinois State Geological Survey in earth resistivity work. The method utilizes a modified Gish-Rooney four-electrode system with commutated direct current applied to two steel current electrodes and a potential-drop measurement taken across two copper "potential" electrodes. Spacing of electrodes is by the Wenner system and is closely related to the diameter of the hemisphere of measurement. By increasing electrode spacing, measurements of resistivity to increasing depths are made.

Empirical interpretation methods suitable for the geological conditions obtaining in Illinois are applied, and all available surface and subsurface information is closely integrated with the resistivity data. Typically, the method is used only for location of relatively thick sand or gravel deposits within 250 feet of the surface. Other applications, such as the location of highway construction materials, have been made. - Authors' abs.

5. RADIOACTIVE METHODS

8554. Barcklow, J. C. Better Interpretation of Neutron Curves. Oil Weekly, Houston, Tex., vol. 118, No. 12, 1945, pp. 53-55.

The most common difficulties in the interpretation of neutron curves arise from the uncertainty of the phenomenon measured by them. Is it relative porosity or the relative total fluid? Why are high intensities found sometime opposite oil staining sections? No successful tests have been made so far to determine the answers. However, comprehensive data were gathered in 1945 by coring 57 feet of Hunton lime in a well of the West Edmond pool, central Oklahoma, for comparing the neutron curve with core analysis.

The results are tabulated, and the significant relationships are expressed in curves. They point to the following conclusions: (1) High intensities occur on curves opposite limestone sections showing oil staining because there is not enough total fluid to affect neutron intensity; (2) the neutron curve generally follows the porosity curve quite closely; however, there are discrepancies when a rock is porous but almost dry; (3) the

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neutron curve follows closely the average curve of relative total fluid, except at greater depths; probably, the ionization chamber does not have time to react. Certain other types of irregularities are indicated. Similar studies through sandstone would shed further light on interpretation. - V. S.

8555. Cullen, T. L. On the Exhalation of Radon from the Earth. Terr. Magn. & Atmos. Elec.; Baltimore, Md., vol. 51, No. 1, 1946, p. 37-44.

Measurements were made, according to the method of Zupancic, of the rate at which the Earth exhales radon. A metal vessel was placed over a section of lawn near the Physics Building, Fordham University, and after a period of accumulation a sample of the gas was withdrawn from the vessel int an ionization-chamber and measured for radon content. The average exhalatic from August 1944 to February 1945 was 8.92×10^{-18} curie per cm^2 per sec. The effect of temperature was studied, and it was found that a maximum exhalation was reached in hot weather and a minimum in cold weather. Snow, it was observed, choked off exhalation and produced very low values in January and February. The effect of rain is complex, heavy rains producing at first great exhalation, then lower values. A study of hourly variations was attempted, and a maximum was found for the morning period of 04^h to 12^h. - Author's abs.

8556. Hess, V. F., and Balling, Eva. A New Determination of Eve's Constant. Trans. Amer. Geophys. Union, Washington, D. C., vol. 26, No. 2, 1945, pp. 237-240.

A new determination of the value of Eve's constant that employed three ionization chambers of various sizes, having area-volume ratios of 0.249, 0.348, and 0.504, respectively, is described. Applying necessary correctior and extrapolating to zero area-volume ratio, a value of Eve's constant of 4.63×10^9 ion-pairs per cc. per gm. radium in air at NTP is deduced. - Authors' abs.

8557. Holmes, Arthur. An Estimate of the Age of the Earth. Nature, Londor vol. 157, No. 3,995, 1946, pp. 680-684.

The age of the earth has been calculated by the author on the basis of A. O. Nier's data on isotopic abundance in lead minerals. These data rule out a post-depositional contamination of lead. The view was therefore adopted that before its concentration in ores, lead had been dispersed through various radioactive source materials in which the primary lead was slowly modified by the addition of radiogenic lead. When computed from the time when the radiogenic lead first began to accumulate in these materials, the age of the earth was found to be of the order of 3,000 million years. The theoretical foundations of such a method of calculation and the findings

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obtained are discussed, with tabulation and plotting of results. The most probable sources of ore-lead appear to be granitic rocks. - V. S.

8558. Korf, S. A. Electron and Nuclear Counters. D. Van Nostrand Co., New York, 1946, 212 pp. Price, $3.

This book summarizes the theory of various types of ionization counters measuring electromagnetic or corpuscular radiation. It deals with the internal mechanism of discharge, constructional and operational features, conventional Geiger counters, counters for special purposes, counters of neutrons responding to gamma radiation, various electronic curcuits, errors made in counting, and corrections. The text is written for users of counters and presupposes some acquaintance with atomic physics. - V. S.

8559. Kuenen, P. H., and Neeb, G. A. The Geological Results of the Snellius Expedition. E. J. Brill, Leiden, 1942, 268 pp.

The two monographs composing this book deal with samples of sea-floor deposits collected during 1929-30 by the Snellius expedition to the sea between the Sunda Shelf and the Sahue Shelf, near Borneo. The first paper discusses methods for gathering samples, describes a new type of sampler specially adapted for the collection of long cores from the sea-floor, and presents conclusions to be drawn from chemical composition and radioactivity regarding the conditions of deposition. The second paper gives a detailed petrographic analysis of the samples. (A review appeared in Geol. Mag., Hertfort, vol. 83, No. 2, 1946, pp. 97-98). - V. S.

8560. McCahon, J. F. A Portable Counting Rate Meter for G-M Tubes. New Zealand Jour. Sci. Tech., Wellington, vol. 27, No. 3, 1945, pp. 254-258.

A description is given of a portable counting rate meter and high-tension supply for Geiger-Müller tubes suitable for use in prospecting for radioactive minerals. - Author's abs.

8561. Mercier, V. J. Radioactivity Logging of Dolomites. Oil Weekly, Houston, Tex., vol. 121, No. 7, 1946, pp. 36-41.

The delineation of the Arbuckle, Makoreta, and Viola dolomites, counted among the most important oil producers of Kansas, offers considerable difficulties. Dolomite is weakly radioactive, cannot be distinguished from limestone on a radioactive curve, and registers unreliably on the neutron curve responsive to porous zones. However, indirect evidence may be gathered from various physical changes in a well logged by the neutron curve. The recording of these changes is discussed, its usefulness illustrated by numerous examples of Kansas logging, and a comparison drawn with electrical logs.

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The evidence tends to support the view that the Kansas dolomites contain porous zones interspersed with dense impervious strata. It shows that more information may be gained by drilling and gun-perforating through dolomites than by using cable-tool methods. - V. S.

8562. Oddone, Emilio. Elementi per una carta delle caratteristiche radioattive del suolo Italiano (Elements of a Map of the Radioactivity Characteristics of Italian Soil). Geofis. Pura & Appl., Messina, vol. 2, No. 2, 1940 pp. 142-152.

A provisional map is prepared of the distribution of radioactive elements in the soil of Italy. It is based upon the table of Stoklasa and Penkava listing the radioactive characteristics of rocks in different geological periods. The advantages of such a map for various types of exploration are discussed. - V. S.

8563. Oil Weekly. Radioactivity Experiments Aim at Finding New Reserves. Houston, Tex., vol. 121, No. 8, 1946, p. 50.

The radioactive investigation of I. Berger, C. Sheppard, and V. Burton sheds new light on the genesis of petroleum and promises advances in oil-finding methods. In the past, high temperatures and pressures had been thought to contribute the energy converting organic matter into petroleum. More recently, bacterial action and energy from the high-speed particles released by radioactivity were deemed potent factors. However, research by the Geology Department of the Massachusetts Institute of Technology shows that there may be enough radioactivity in the organic materials themselves to effect the conversion over a period of 10 to 100 million years. Certain fatty acids isolated from ocean-bottom muds and exposed to laboratory bombardment by alpha particles from radioactive disintegration were converted into straight chain and cyclic hydrocarbons which make up the greater proportion of natural petroleum. Work is now in progress on complex organic substances and the measuremtnt of radioactivity in earth materials. - V. S.

8564. Roberts, J. E. Spectrum of Radium (B + C) Gamma Rays. Philos. Mag., London, vol. 36, No. 255, 1945, pp. 264-269.

Using the experimental results of Skobelzyn and of Ellis and Aston, the energy distribution in the gamma-ray spectrum of radium (B + C) with varying degrees of filtration has been calculated. From the energy distributions, the scattering absorption coefficients of the heterogeneous radiations have been computed and compared with recent measurements made by the author of absorption in aluminium and carbon. - Author's abs.

8565. Rothé, E. Concentration of Radioactivity. Compt. rend. Acad. Sci. Paris, vol. 211, 1940, pp. 753-756.

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A number of observed natural accumulations of Ra and Th are described. The most striking are in clay nodules in a Permian rhyolite quarry in the Saint-Dié district, and in parts of a granite formation in the Puy-de-Dôme area. - L. J. J., British Abstracts, London, March 1946, A-1, p. 103.

6. GEOTHERMAL METHODS

8566. Mine and Quarry Engineering. Rock Temperatures. Maidenhead, Berkshire, vol. 10, No. 9, 1945, pp. 209-210.

The parallel investigations of rock temperature conducted on the Witwatersrand, South Africa, by R. A. H. Flugge de-Smidt and Oscar Weiss are outlined. They purported to determine the temperatures to be encountered in mining operations to depths of 9,000 feet. To obtain mutually checking results, the investigators worked independently and used different methods; clinical thermometers served in the first survey, and electrical resistance thermometers in the second. The conclusions reached for a depth of 8,000 feet were, respectively, 103° and 101.3° F. Such close agreement attests the precision of the methods.

Flugge de-Smidt lowered into a borehole a frame of treated hardwood having the length of the hole and carrying a series of thermometers inserted in recesses 4 feet apart. A simultaneous record was thus obtained through the entire depth investigated. Before use, the thermometers and the frame were kept frozen; in their recesses, the thermometers were packed with crushed ice. The frame remained in the borehole for 48 hours. Special precautions were also taken upon withdrawal to eliminate the effects of outside temperature.

Weiss took the view that the framework should be made of thin-walled metal tubes with heat-insulating joints and be maintained at the expected rock temperature. Other differences existed between the two investigators, but in their totality they contributed substantially to knowledge of thermal conditions and measurements at great depth. - V. S.

8567. Oulianoff, Nicolas. Mesures géothermiques dans les puits de forage (Geothermal Measurements in Boreholes). Verh. Schweiz. Naturforsch. Ges., Geneva, 1941, pp. 101-102.

Geothermal measurements were made in two boreholes near Lausanne and Yverdon, Switzerland, during the boring. Maximum thermometers were used. A preliminary report is given on the investigation. - V. S.

7. GEOCHEMICAL METHODS

8568. Brewer, A. K. The Mass Spectrometer as an Analytical Tool. Min. & Metal., New York, vol. 27, No. 472, 1946, pp. 207-209.

A new tool of atomic analysis has been introduced into chemical laboratories - the mass spectrometer. It separates atoms and mass groups by

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utilizing their momentum, instead of solubility and chemical properties, and requires very little time and material. So far, the spectrometer is applicable only to gases and hydrocarbon vapor, but this handicap is being overcome.

The method of analyzing soil for natural oil and gas, developed by H. Hoover, Jr., and H. W. Washburn, consists in bombarding hydrocarbon molecules by electrons of an energy of 50 to 100 volts, sufficient to form positive ions. Such bombardment breaks the molecules down into fragments having always the same mass and relative abundance in individual compounds but never in different compounds; the steps of the precedure are described. The results of the analyses register photographically as a series of peaks, depending upon the chemical nature of the sample. It takes only 10 to 30 minutes to run a sample through the instrument but 1 to 20 hours to calculate the composition of the material. Precision ranges from a few tenths to a few thousands of 1 percent.

At present, spectrometer analysis serves primarily for the detection and measurement of isotopes; the different lines of investigation in this field are described. Other applications appear likely in the near future.- V. S.

8569. DeMent, Jack. Fluorochemistry in Petroleum Science. Ultraviolet Products Co., Los Angeles, Facts about Mineralight, Bull. 2, 1944, 4 pp.

L. W. Blau has developed a method of exploring petroleum deposits by gauging their fluorescence effects on the surface. Oil accumulations give off hydrocarbon gases, which diffuse upward and produce in the surface soil conditions attracting certain bacteria, such as bacillus methanicus and bacillus ethanicus. These bacteria multiply and change the gases into fluorescent substances that respond to ultraviolet light by glowing.

In a survey, soil samples free from plant admixture are collected on the surface and at uniform depths within several inches. They are further examined under an ultraviolet lamp and graded as to degree of fluorescence by comparisons with assorted fluorescence standards of known intensity. The results, plotted on a map, serve as a guide for more detailed exploration. - V. S.

8570. Dzens-Litovsky, A. I. Natural Gases in Bottom Deposits of Mineral Lakes. Compt. rend. (Doklady) Acad. Sci. URSS, Moscow, vol. 48, No. 7, 1945, pp. 491-493.

Surveys of mineral lakes in south Russia, western Siberia, and central Asia have shown that their bottom silts and chemical sediments usually contain gases throughout their thickness. In the course of drilling, the brine was observed to bubble with liberated gases, particularly in the mineral lakes in deserts which had the highest gas saturation.

The major part of the gases is hydrocarbons, mostly methane mixed with nitrogen. They are rich in light combustible constituents mixed with hydrogen sulphide. One lake in the Crimea contained almost pure methane, which burned for several hours. The various microbiological and chemical

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processes producing the gases and the migration and accumulation of gas are discussed. It is concluded that the origin and formation of natural gases in the fossil salts of mineral lakes should be sought in recent bottom depositions. - V. S.

8571. Gabriel, V. G. Present Status of Geochemical Prospecting. Oil - Weekly, Houston, Tex., vol. 118, No. 10, 1945, pp. 50-53.

Geochemical prospecting is traced from its inception in the research of Munn and Rich three decades ago, through its development in the investigations of Hassler, Laubmeyer, and Sokolov, to its culmination in the field work of Rosaire, Horovitz, McDermott, and Pirson.

The field methods of soil analysis used by Rosaire, Horovits, and McDermott aim at determining gaseous, liquid, and solid hydrocarbons and certain inorganic substances in the soil. Oil possibilities are judged by the presence, concentration, and distribution of significant constituents. The chief difficulties lie in the uncertainties of the upward migration of oil and gas and the incompleteness of regional geochemical data. The geodynamic method of Pirson analyses the undisturbed rate of hydrocarbon-gas diffusion through the area investigated with a view to determining the possible existence and approximate depth of oil accumulations.

The results of different geochemical surveys made during 1936-42 and reported in the literature are tabulated. They show that very few oil fields were found, but that the already discovered pools were delineated and expanded successfully. Further advances are expected to lead to a greater precision of geochemical exploration. The paper is supplied with a bibliography. - V. S.

8572. Pirson, S. J. Disturbing Factors in Geochemical Prospecting. Geophysics, Tulsa, Okla., vol. 11, No. 3, 1946, pp. 312-320.

A review of the results of over 3,000 measurements of soil ethane emanation-rate made over the past 5 years has revealed a number of conclusions which have an important bearing upon the validity of geochemical methods of prospecting for oil and gas wells. A number of factors have been found to be highly disturbing, namely, earth topography, ground-water percolation and seepage, barometric-pressure variations, etc. These effects result in fluctuations of the rate of escape of hydrocarbon accompanied by horizontal shifts of leakage, which gives rise to the creation of artificial leakage highs altogether meaningless from the point of view of oil and gas accumulation at depth. Certain qualitative rules of interpretation have been established, which permit weeding out of the meaningless anomalies provided enough information is at hand on the topography and watertable movement.

A further observation has been made indicating that the artificial anomalies are often of greater magnitude than the significant measurements. Hence, the problem, so common in other geophysical methods, of making important reductions on the observed figures is imperiously facing the exploration geochemist if he is to develop a valuable prospecting tool. A serious attempt is presently made to solve this problem. - Author's abs.

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8573. ZoBell, C. E. Studies on Redox Potential of Marine Sediments. Bull. Am. Assoc. Petrol. Geol., Tulsa, Okla., vol. 30, No. 4, 1946, pp. 477-513.

Redox potential is defined as the electron-escaping tendency of a reversible oxidation-reduction system. It expresses quantitatively the reducing intensity of such a system and can be measured in volts, as an electromotive force referred to a standard hydrogen half-cell. This intensity apparently has a pronounced effect upon the diagenesis of sediments, including the conversion of organic matter into petroleum. Methods of measuring the potential and related values in sedimentary materials are described and discussed.

The data gathered on more than 1,000 samples of bottom deposits show that each type of sediment has its own redox characteristics. In recent sediments, values range between +.35 and -.50 volts. As a general rule, the potential decreases with core depth, indicating that conditions become more alkaline. Positive values are usually typical of bottom deposits poor in organic matter; negative values, of deposits rich in organic matter. Some other findings are outlined. - V. S.

8. GENERAL AND UNCLASSIFIED GEOPHYSICAL SUBJECTS

8574. American Geophysical Union. Education in Geophysics. Transactions, Washington, D. C., vol. 26, No. 3, 1945, pp. 463-476.

A comprehensive tabulation is presented of courses in geophysics offered in American colleges and universities. The information was collected in 1945 by means of a questionnaire distributed in response to the War Manpower Commission program of assistance to returning servicemen and women. The geophysical branches listed in the questionnaire included seismology, geodesy, terrestrial magnetism and electricity, tectonophysics, volcanology, and geophysical exploration. The table gives the various courses taught in these sciences in 108 educational institutions in 44 States in the United States; not all the answers were included. The total material indicates that only a few schools now have Departments of Geophysics. However, there are good opportunities to integrate from the established curricula a course for a Bachelor of Geophysics degree. Generally, students can readily select courses suitable to preparation for a geophysical career. - V. S.

8575. American Geophysical Union. Canadian Committee on Geophysics. Trans. Washington, D. C., vol. 27, No. 2, 1946, p. 298.

A Committee on Geophysics has recently been established as an associate committee of the National Research Council of Canada. Membership includes geophysicists from Federal and Provincial departments and the universities. There are six subcommittees. Widespread interest is manifested not only in geophysical prospecting but also in long-term geophysical studies. - Abridged by V. S.

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8576. Anderson, J. F. Trends in Geophysical Exploration. World Petrol., New York, vol. 17, No. 3, 1946, p. 43.

The wartime search for oil has brought to geophysical methods general recognition and a closer integration with geology. Definite trends were also observable in the use of different methods, organization of exploration, and related research.

The seismic method has scored the greatest gains and is being adopted by large and small oil companies. It is now regarded as a necessary part of every exploration program, especially for low-relief structures, stratigraphic features, flanking of salt domes, marshes and swamps, inland and coastal tidewaters, and special problems. To improve interpretation, a party manager often makes a daily reading of field data in the district headquarters of a survey, where he can have fuller geological information at his disposal. Still other developments in seismic exploration are indicated.

General geophysical research tends to concentrate on improving existing methods, instruments, and equipment rather than on searching for new principles of exploration. The geophysical-service companies have multiplied threefold during the last four years. - V. S.

8577. Boots, P. H., and McKee, A. H. Geophysical Operations in Kuwait. Geophysics, Menasha, Wis., vol. 11, No. 2, 1946, p. 164-177.

This paper describes the general operations of the combined geophysical party, using gravity, magnetic, and seismic methods, which made a survey of Kuwait in one working season. The organization of the party, the general conditions met, and the manner in which the operations were adapted to the country and its people are outlined. The geophysical results themselves are not included, but it may be remarked that the surveys described led to the discovery of one of the great oil fields of the world. - Authors' abs.

8578. Coffin, R. C. Recent Trends in Geological - Geophysical Exploration and Methods of Improving the Use of Geophysical Data (abs.). Oil and Gas Jour., Tulsa, Okla., vol. 44, No. 48, 1946, p. 91.

Since 1942, the use of gravimetric methods has increased in the United States approximately 200 percent, seismic methods 60 percent, core drilling 100 percent, and the magnetic investigations 70 percent. The impact upon geological thinking because of this continued increase of geophysical effort is discussed. Full advantage offered by these methods and combinations of methods is not being made. A better use of the low-cost methods is pointed out. Tremendous increase in the use of the gravity method has not been made with corresponding improvement in the proper understanding of its possible use and its limitations. The use of the gravity method is discussed in some detail. A tremendous improvement in our geological thinking and a better use of geophysical data are possible by an education of district or "grass root" geologists in geophysical concepts and a freer use of this information.

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A trend in this direction is noted, but the need of an accelerated move in this trend is emphasized. - Author's abs.

8579. Deegan, C. J. Large Exploration Campaign Under Way in Canada. Oil & Gas Jour., Tulsa., Okla., vol. 44, No. 34, 1946, pp. 274-275.

In Canada, exploration for oil is gaining momentum. American, British, and Canadian interests conduct operations, particularly in the Rocky Mountain foothills of Alberta and the plains of the east. The work is carried out by seismic, gravimetric, and geological methods and by test drilling. A cooperative aerial photo-survey financed by six groups has been made in the Alberta hills. - V. S.

Fisher, G. R. Geophysical Prospecting for the Layman. Fisher Research Laboratory, Palo Alto, Calif., 1946, 47 p. (See abs. 8548 in this issue.)

8580. Gallet, E. S. Estudios y exploraciones petroliferas effectuados en Magallanes e Isla Grande de Tierra del Fuego (Petroleum Studies and Surveys in the Magallanes and the Isla Grande de Tierra del Fuego). Bol. Minero, Santiago de Chile, No. 549, 1946, pp. 6-8.

The Corporation de Fomento de la Produccion, Chile, has investigated petroleum possibilities in the province of Magallanes and the Isla Grande de Tierra del Fuego. The work included stratigraphic studies and geophysical exploration. Preliminary geological reconnaissance reduced an originally promising area of 30,000 km.^{2} to 1,000 km.^{2} for detailed surveys. Favorable stratigraphic indications were then found in the sandstone conglomerate "Remarcable" on Isla Englefield; the local geology is described. Geophysical findings localized structures on Isla Grande de Tierra del Fuego; they are discussed. It is proposed to continue exploration to determine whether the oil is available in commercial quantity. - V. S.

8581. Geophysics. The Job of the Geophysicist. Menasha, Wis., vol. 11, No. 2, 1946, pp. 221-224.

Answers are given to questions concerning the work of geophysicists, such as: What do geophysicists do, where do they work, what do they earn, what is the outlook, where to prepare for a geophysicist's career, what subjects must be studied, what jobs are related to geophysics, etc. The information is furnished to assist persons in choosing an occupation, particularly college students and servicemen. It is essentially a reprinting of Occupational Brief No. 26, dated Sept. 1, 1945, prepared by the National Roster of Scientific and Specialized Personnel of the War Manpower Commission for use in the education programs of the Armed Services. - V. S.

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8582. Heiland, C. A. Geophysics. Min. & Metal., New York, vol. 27, No. 470, 1946, pp. 109-114.

Geophysical exploration in the United States and abroad during the year 1945 is reviewed. Noteworthy technical developments are indicated, and contributions to the war effort are outlined.

1. Oil and Metals Exploration in the United States. (a) Oil: The total outlay of the petroleum industry for geophysical work was about $55,000,000, divided as follows: Seismograph, $39,000,000; gravimeter, $9,000,000; magnetometer, et al., $1,000,000; and electrical well-logging, $6,000,000. The estimated percentage of well-completions logged electrically mounted continuously through the last five years: 1941, 37 percent; 1942, 43 percent; 1943, 57 percent; 1944, 64 percent; 1945, 74 percent. Worthy of particular note are surveys in the eastern Gulf and Seaboard States, seismic and gravimetric work in the Rocky Mountain States extending into Alberta, Saskatchewan and farther northward, and exploration on Cape Simpson, Alaska. (b) Metals: Strategic metals were sought in various States by the Bureau of Mines and private consulting firms. The Bureau made magnetic surveys for iron in New York, Virginia, and Utah, for magnetite in North Carolina and Tennessee, and for manganese in Massachusetts and New Mexico; electrical surveys for copper in Vermont, Nevada, and Arizona; and surveys for copper in Virginia and New Mexico, lead in Kansas and Oklahoma, and lead and zinc in Virginia. The S. F. Kelly Geophysical Services Co. surveyed fluorite in Illinois, syenite in Arkansas, and lead in Missouri; the latter deposits were also explored by the Bureau of Mines and the Geophysical Exploration Co.

2. Oil and Metals Exploration in Foreign Countries. (a) Oil was sought mostly in the Caribbean area and South America; exploration increased nearly 50 percent over 1944, averaging about 60 seismic, 30 gravimetric, and some geochemical and magnetometer parties. In Venezuela and Columbia, surveys by different oil companies continued or increased. Various geophysical methods were used in Cuba, Trinidad, Ecuador, the Dominican Republic, Brazil, Argentina, Paraguay, and Chile. There was also exploration in Saudi Arabia, Egypt, France, and England. In Russia, 30 seismic and 25 electrical parties worked in the "Second Baku" region; discoveries were made in the Syzran and Saratov areas. (b) Exploration for metals continued intensively in Canada. The Lundberg Co. reports magnetic, resistivity, radiograph, electromagnetic, and spontaneous polarization surveys in 32 mining properties. The consulting firm of Koulomzine, et al, made 41 surveys, mostly magnetic. Other firms likewise made surveys.

3. Technical Advances: Many gains were made in geophysical methods and in related fields. As far as information is available, no revolutionizing discoveries occurred. (a) Exploration techniques benefitted particularly by improvements in gravimeters and magnetometers for submerged areas. Seismic methods of refraction with continuous profiling and "arc" mapping were revived. Fluorographic, surface-temperature, and electrolytic-model techniques received further attention. (b) Advances in related fields occurred both through the strategic projects involving prospecting techniques and through affiliated research conducted by geophysicists for the armed forces. The strategic projects included, in addition to exploration for oil

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and minerals, aerial magnetic mapping, land-mine detection, and salvage. Airborne magnetometers served for mapping oil structures in Oklahoma and Alaska and iron deposits in Michigan and the Adirondacks. Stretegic research covered radar, proximity-fuse, atomic-bomb, magnetic mine countermeasures, sonar, sound-ranging, acoustic-bomb, and aircraft testing. (Summaries of this review appeared in Oil & Gas Jour., vol. 44, No. 43, 1946, pp. 58-59; World Petrol., vol. 17, No. 3, 1946, pp. 52-53; and Min. Jour., London, vol. 226, No. 5769, p. 209.) - V. S.

8583. The Independent PAA Monthly. Exploration Associations Hold Meeting. Tulsa, Okla., vol. 17, No. 1, 1946, p. 18.

The Society of Exploration Geophysicists (SEG) held its first post-war annual metting jointly with the geologists' AAPG and the paleomineralogists' SEPM, in Chicago. At the SEG technical sessions numerous papers on instruments, practical applications, and general principles were read. Much interest was aroused by S. J. Pirson's report on geochemistry and E. Frowe's account of a diving bell for gravimeter operations. (See also Oil & Gas Jour., vol. 44, No. 48, 1946, pp. 83-84). - V. S.

8584. Kelly, S. F. Geophysicists Suggest More Joint Meetings in the Future. Min. & Metal., New York, vol. 27, No. 472, 1946, pp. 224-225.

At the A.I.M.E. annual meeting of 1945 in Chicago, the joint session of the committees on geophysics and on mining geology heard papers on the general progress of geophysics, interpretation of magnetic observations, radioactivity logging in drill holes, and electrical tracing of diamond-drill holes. The discussions centered principally on the new airborne magnetometer, the advantages of measurements from several altitudes, the causes of radioactive emanations from sedimentary rocks, and the disturbing factors introduced into electrical logs by the process of drilling. Joint meetings of geophysicists, geologists, and mining engineers were considered a desirable practice. - V. S.

8585. Langley, K. J. Brazil Shows Good Geologic Possibilities of Commercia Quantities of Petroleum. Oil & Gas Jour., Tulsa, Okla., vol. 44, No. 34, 1946, pp. 162-164.

In Brazil, all the activities connected with oil exploration are administered by the National Petroleum Council created in 1938. The Council initiated geophysical surveys and drilling operations in the States of Bahia and Alagoas. For the geophysical work, it contracted the services of the United Geophysical Co., De Golyer & MacNaughton Co., and Schlumberger Surenco, S. A. The belt of Cretaceous sediments, where the operations are conducted, comprises the Reconcavo region around the bay of Todos os Santos. Geologically, the bay is a tectonic trough limited on the east and west by arcuated faults. A number of producing fields have been discovered in Bahia. - V. S.

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8586. **Lee, F. W.** Geophysical Exploration of Submerged Areas on the Continental Shelf of the United States Territories. U. S. Senate Special Committee Investigating Petroleum Resources, S. Res. 36, 1945, Washington, D. C., 1946, pp. 386-405.

Geophysical methods of exploration for oil are discussed in application to the continental shelf of the United States. Numerous maps with explanatory notes illustrate the geology of the shelf.

The principles of exploration on land and under water are basically the same, for they deal with the same oil accumulations and aim at the same information. The differences consist mainly in the lack of firm foundation handicapping orientation and the use of leveling instruments and other equipment. Therefore, special prospecting techniques, instrumental devices, corrections, and modes of interpretation must be developed to attain the high precision necessary; the depth of the water, climate, and local conditions also have an important part in these adjustments.

The possibilities of the adaptation of magnetic, gravimetric, seismic, and geochemical methods to the exploration of the shelf are examined in the light of available information. The Gulf of Mexico is regarded as particularly suitable for underwater prospecting because of its good promise of oil, shallow water, and temperate climate. Research on underwater surveys would require a central institute with laboratory facilities for instrumental and marine investigation, processing of field data, and administration of the work, as well as airplane hangars and ship drydocks. - V. S.

8587. **Lundberg, Hans.** Modern Methods in Geophysics. Northern Miner, Toronto, vol. 31, No. 51, 1946, p. 21; also Min. Jour., London, vol. 226, No. 5774, 1946, p. 310; and Western Miner, Vancouver, B. C., vol. 19, No. 5, 1946, pp. 46-47.

Prospectors can make use of geophysical equipment with a little instruction in field techniques, and they do not need extensive theoretical knowledge to conduct geophysical surveys. Some instruments are simple to operate but scientifically sound and sufficiently sensitive to be effective. In the case of complex geology, novices may consult expert geophysicists. Equipment should be rentable on reasonable terms.

In Canada, most suitable for metals prospecting are the magnetic and electrical methods. Similar to other tools, they have their limitations. Rock formations abound in magnetic and electrically conductive bodies that possess no commercial value and dictate caution. However, when both imagination and skill are used in correlating magnetic and electrical data and observations of topography, soil, water, rock outcrops, and vegetation, the efforts bear results.

The exploration of deep deposits and the use of the latest geophysical instruments usually require more preparation than mere mastery of apparatus and field techniques. Some of the new inventions made during the war promise substantial gains in the depth and expanse of surveys. (A review appeared in Min. Mag., London, vol. 75, No. 1, 1946, pp. 59-60.) - V. S.

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8588. Merritt, J. W. Geotechniques of Oil Exploration. Oil Weekly, Houston, Tex., vol. 121, No. 5, 1946, pp. 17-22, 26.

Different geophysical methods of oil exploration are discussed in their common dependence on the basic phenomena of petroleum genesis. Consideratio is devoted to electrical, geothermal, and radioactivity methods classed as direct, and to seismic, gravimetric, and magnetic methods classes as indirect.

Factors common to both classes of methods relate mostly to the conditions or to the effects of oil accumulations. (1.) Oil is usually found in water-bearing strata, with water composition pointing to sea origin; it floats on the water and migrates along the relief until trapped in reservoir created by the forces of compression, tension, or processes of sedimentation pore formation, etc. (2.) Oil accumulation results in the escape of light hydrocarbons, their water loading, modification by radioactivity and evaporation, a replacement by solutions from adjacent rocks, concentration and partial precipitation of solid compounds, and an increase in the density of the bed rocks.

These phenomena affect the velocity of sound waves, increase electrical conductivity, radioactive intensity, and gravity, attract the hydrocarbon-feeding bacteria, etc. Such common causes explain the interdependence of different methods and clarify the general conditions of successful operation such as sufficient density of test points, control of variables, rectification of errors, skillful interpretation, etc. - V. S.

8589. Mitchell, D. R. Geological Sessions Include a Bit of Geophysics and Fluorescence. Min. & Metal., New York, vol. 27, No. 472, 1946, p. 225.

Geophysicists presented papers on magnetic and electrical exploration at the sessions of mining geologists held at the A.I.M.E. annual meeting of 1945 in Chicago. (1.) Reports on magnetic exploration: R. H. B. Jones' pape indicated that the most highly magnetic chrome-ore is not always the richest as evidenced by measurements on the Mesabi Range. H. E. Hawkes showed by an example in the Adirondacks that reconnaissance can be rapid and cheap if guided by geological information. F. H. Kihlstedt reported on the discovery of a large magnetite deposit in Larap, P. I., made owing to correct understanding of an unusual type of geological structure. (2.) Reports on electri exploration: S. F. Kelly's survey at the Chelan deposit, Washington, rapidl restricted the areas deserving further detailed study. R. A. Clark discovered ore at the Molton Hill deposit, Quebec, by following a shear zone identified by means of geological evidence. - V. S.

8590. Mitchell, W. R., and Wipff, F. P. Q-Meter for Low-Frequency Reactor Measurements (abs.). Oil & Gas Jour., Tulsa, Okla., vol. 44, No. 48, 1946, p. 97.

A direct-reading Q meter is described that permits the determination of Q and inductance over a frequency range of 10-1,000 cycles and a voltage range of 2-10,000 millivolts. The instrument is particularly well-adapted

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to the measurement of reactors and transformers used in geophysical equipment. The theory of operation of the Q meter is given, and some of the precautions that must be observed are discussed. The schematic diagram and photographs of the instrument are included, and some of the more important constructional details are discussed. - Authors' abs.

8591. Oil and Gas Journal. Venezuela's 1946 Exploratory Program Biggest in Histroy. Tulsa, Okla., vol. 44, No. 34, 1946, pp. 265-273.

The program of oil search in Venezuela during 1946 calls for the largest exploration campaign in histroy. Such intensive work is proposed because the local law governing concessions requires that the acreage held for detailed exploration be selected during a period of 3 years; the time for the present concessions expires mostly about the end of 1947. During 1945, exploration was on a greater scale than ever before. In all, 27 seismic, 9 gravimetric, and 14 geological parties worked in the field; among them, 19 seismic parties explored eastern Venezuela. The geographic distribution of geophysical surveys is indicated, and some details of the work are given. There was also considerable photogeoloical surveying, as well as photogrammetric work and test drilling. The program for 1946 calls for seismic, gravimetric, and magnetic exploration. - V. S.

Rankine, A. O., and Evans, P. Geophysical Prospecting for Oil in India. Petrol. Times, London, vol. 50, No. 1,272, 1946, pp. 432-434 (see abs. 8490 in this issue).

8592. Rozlosnik, Andres. Antecedentes e perspectivas futuras da exploracao petrolifera Argentina (Antecedents and Prospects of Oil Exploration in Argentina). Mineracao e Metalurgia, Rio de Janeiro, Brazil, vol. 10, No. 56, 1945, pp. 65-74.

The author reviews petroleum exploration in Argentina during the periods 1907-23, 1924-32, and 1933-45. The progress achieved is discussed step by step and illustrated by maps; particular attention is devoted to the provinces of Neuguen, Salta, Jujuy, and Mendoza. Total statistics as of January 1945 show the following geophysical coverage: Torsion balance, 220,460 sq. km.; gravimeter, 162,790 sq. km.; magnetometer, 39,367 sq. km.; seismic refraction, 70,432 sq. km.; and seismic reflection, 17,292 sq. km. The future prospects of exploration are examined for Gondwana, Chaco-Paraense, Salado, and other rock units. -- V. S.

8593. Tiratsoo, E. N. Future Role of Air Transport in the Search for Oil. Petrol., London, vol. 9, No. 2, 1946, p. 32.

In the immediate postwar years, airplanes will serve the following purposes in oil exploration: (1) Preliminary reconnaissance of areas to discover drainage, physiographic features, and potential structures;

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(2) detailed examination of selected structures by means of vertical and oblique photographs; (3) landing of the ground crews; and (4) supplying land parties with parachuted stores, equipment, etc. The techniques of flying, photographing, parachuting, and cumminication are discussed briefly. - V. S.

8594. Todd, J. D. North Florida is Geologically Attractive. World Petrol., New York, vol. 17, No. 3, 1946, pp. 44-46, 94.

Florida north of the Central Platform and the related parts of Georgia and Alabama increasingly attract the attention of oil companies. The subsurface here is not flat, as had been supposed, but consists of a varied relief known to hold promising structures; the local geology is described. Geophysical activity has been growing yearly and attained a high of 1,397 crew weeks in 1945.

The magnetometer proves the most effective instrument for delineating the basement. The gravimeter is widely used for mapping large areas; gravity and magnetic observations are sometimes combined. The seismograph has encountered considerable difficulties because of cavernous surface, ground roll, absence of deeper reflecting changes, lateral velocity variations, and unfamiliar terrain; however, shallow reflection may have some possibilities. Generally, the North Florida Province is regarded as a very promising oil region. - V. S.

8595. Vinson, Curtis. Mexico Intensifies Search for Petroleum. Petroleo Interamericano, Tulsa, Okla., vol. 4, No. 2, 1946, pp. 34-43.

In Mexico, the Government corporation "Petroleos Mexicanos" (Pemex) has expanded its search for oil during recent years. The number of prospecting parties totaled 16 in 1943, 24 in 1944, and 29 in 1945, the latter number comprising 17 geological, 6 seismograph, 4 gravimeter, 1 electrical, and 1 core-drilling parties. Intensive search is carried on in the Nuevo Leon, Tamaulipas, Tampico-Tuxpan, Isthmus, and Lower California regions; there is also activity in Chihuahua, Oaxaca, Guerrero, Tabasco, Nayarit, and Chiapas. The distribution of the parties and the results of their work are described. In 1946, the number of parties probably will be increased to 35 or more. - V. S.

8596. Wooley, W. C. Geophysical History of the La Gloria Field, Jim Wells and Brooks Counties, Texas. Geophysics, Tulsa, Okla., vol. 11, No. 3, 1946, pp. 292-301.

This paper presents a historical record of geophysical activity in the area of the La Gloria field. The successive stages of geophysical exploration were (1) torsion balance, Magnolia Petroleum Co., 1934-35; (2) seismograph: correlation reflection, Independent Exploration Co., 1936; dip reflection, Magnolia Petroleum Co., 1938; and (3) gravimeter, Coastal Oil Finding Co., 1945. The discovery well, Magnolia's Sam Maun, was drilled and completed in 1938-1939, and produced initially 165 barrels.

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Oil and gas in the La Gloria field are being produced from sands in the Frio formation of Oligocene age. A number of sands produce gas distillate. Several flank wells produce oil. - Author's abs.; abridged by V. S.

8597. World Petroleum. Marsh Buggies Hunt Oil in Swamplands. New York, vol. 16, No. 10, 1945, p. 90.

Geophysical exploration in swamplands such as those in the Gulf States and Central America will be facilitated by the new amphibious vehicles for the transportation of equipment and personnel. These "buggies" bear floating tires 10 feet in diameter, weighing 315 pounds, containing an inner tube of 125 pounds, and mounted on hollow, air-tight, aluminum wheels. Accordingly, the buggies can navigate in streams and lakes of any depth, and they operate on marsh and dry land. The tires and wheels are manufactured by the Goodyear Co. The Gulf Research & Development Co. will use the buggies in Nicaragua. - V. S.

9. RELATED NON-GEOPHYSICAL SUBJECTS

8598. Andronov, I. Oil in the Devonian Strata. Petroleum, London, vol. 9, No. 3, 1946, p. 50.

Devonian strata once yielded large quantities of oil in Pennsylvania. At present, much Devonian oil is being discovered in the U.S.S.R. The deposits, the first of their kind in that country, lie mostly in the Volga-Bashkiria-Urals triangle. Originally identified by I. Gubkin before World War II, they were surveyed during the war and drilled in 1944. The largest production is obtained along the Samarskaia Luka-Tuimazy line and about Krasnokamsk. There are also Devonian deposits outside this triangle, northward near Ukhta, southward near Saratov, and west of Swedlovsk. - V. S.

8599. Bays, C. A. Petroleum Possibilities of Maquoketa and "Trenton" in Illinois. Illinois Geological Survey, Rept. of Investigations 105, Urbana, Ill., 1945, pp. 35-38.

Possibilities of commercial petroleum production from the Maquoketa and "Trenton" strata of Illinois are most likely to occur in the sandstones of the Maquoketa formation and the areas of secondary permeability in the Galena formation. There has been insufficient testing of strata below the Decorah formation. The southwestern portion of the State is recommended for exploration of the Maquoketa formations, and the area flanking the Ozark uplift in southwestern Illinois is thought to be most favorable for testing the Galena formation. Inasmuch as the evidence suggests anticlinal rather than stratigraphic-trap control of production, normal structural methods of surface, subsurface, and geophysical exploration are applicable. - Author's abs.

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8600. DeGolyer, E., and Vance, H. Bibliography on the Petroleum Industry. Texas A & M College, College Station, 1944 (1945), 730 pp. Price, $2.

The references of this bibliography on the petroleum industry are arranged under the following headings: General Data; Geographic Distribution; Physical and Chemical Properties; Exploration and Prospecting; Geology Development of Deposits; Production; Transportation, Storage and Gaging; Refineries and Refinery Practice; and Economics of the Petroleum Industry. These are further subdivided under some 900 subjects by means of the decimal system. An alphabetical subject list at the end permits one to run down a desired article or subject. The arrangement under the subheadings is by title. - Review, Econ. Geol., vol. 41, No. 3, 1946, p. 285; abridged by V. S

8601. Department of Mines and Resources, Canada. Geological Map of the Dominion of Canada. Mines and Geology Branch, Ottawa, Map 820A, 1945. Price $0.50.

This map is published as two sheets, each 44 x 32 inches, on a scale of 1 : 3,801,600 (1 inch = 60 miles) on a Lambert conformal conic projection. A fortunate choice of colors, in good register and applied to a new base, depicts the geology of the vast reaches of Canada in considerable detail. The details vary from place to place and are gratest in the marginal parts of the Laurentian shield and in the southern and western parts of Canada in general, reflecting the greater knowledge of these more accessible and more important mineral-producing areas. - F. J. Pettijohn, Jour. Geol., vol. 54, No 2, 1946, p. 135; condensed by V. S.

8602. Gross, H. E. Possibilities and Problems of Drilling Beyond the Continental Shelf (abs.). Oil & Gas Jour., Tulsa, Okla., vol. 44, No. 43, 1946, pp. 57-58.

The reasoning that geological configurations do not coincide with the boundaries of continents and that formations continue into the continental shelves is advanced one step farther: It is considered that the formations do not coincide with the boundaries of continental shelves but continue into the deep floor of the ocean. This logic would also apply to the oil-bearing formations. Accordingly, the question arises: Can deposits in the deep ocean floor be exploited commercially? Some advantages and disadvantages of drilling beyond the continental shelf are listed. For drilling in water deeper than 500 to 600 feet, rigid foundations become too costly, and floatin foundations would be used. The technical requirements toward floating derricks, casings, pipes, drilling platforms, anchors, stability, torsion, etc. are briefly indicated. - V. S.

8603. Krynine, P. D. The Tourmaline Group in Sediments. Jour. Geol., vol. 54, No. 2, 1946, pp. 65-87.

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Tourmaline is really a complex isomorphous mineral group that can easily be differentiated under the microscope into a series of varieties and types. These types are based upon the recognition of five main sources of tourmaline in sediments - granitic, pegmatitic, metamorphic injected, sedimentary authigenic, and reworked sedimentary detrital. Actual examples of the application of these concepts to the solution of problems of correlation, interpretation, and differentiation of sediments and to the reconstruction of paleogeographic conditions are given. - Author's abs.

8604. Lahee, F. H. Wildcat drilling in 1945. Oil and Gas Jour., Tulsa, Okla., vol. 44, No. 49, 1946, pp. 64-66.

A statistical account is given of wildcat drilling for oil in 30 States in the United States during 1945. In all, 21.6 percent of the holes drilled and 23.9 of the footage were successful; that is, one producing foot was drilled for every 3.19 feet of dry hole, and one successful well for every 3.62 dry holes. As regards local results, Southern States gave somewhat higher figures.

The various prospecting methods used for locating the drilling sites had the following relative success: Geology, 833 holes productive, 2,827 dry; geophysics, 142 p, 550 d; geology and geophysics, 140 p, 320 d; sundry nontechnical, 47 p, 404 d; unknown, 52 p, 298 d; totals, 1,214 p, 4,399 d; grand total, 5,613 holes drilled. These figures show that 23.2 percent of the wells drilled on technical advice were productive, as contrasted with 10.4 percent successful in the case of nontechnical advice. Thus, locations based upon technical exploration were 2.2 times as successful as those drilled without it. (Statistics for 1938-45 appeared in World Petrol., New York, vol. 17, No. 6, 1946, pp. 56-58.) - V. S.

Longwell, C. R. Tectonic Map of the United States. Bull. Am. Assoc. Petrol. Geol., vol. 28, 1944, Tulsa, Okla., vol. 28, 1944, pp. 1767-1774. (See abs. 8608 in this issue.)

8605. Mackay, R. A. The Control of Impounding Structures in Ore Deposition. Econ. Geol., Lancaster, Pa., vol. 41, No. 1, 1946, pp. 13-46.

Various structures have been described from time to time as superimposed strata, blankets, traps, dams, inverted ponds, and ponds. It is the theme of this paper that the relatively impermeable barriers common to these structures have impounded the solutions in such manner as to cause the metals to be deposited within the structure and to allow the solvent or ore carrying fluid to pass on through the relatively impermeable barrier.

It is shown that some elements require a more perfect barrier than others to impede their progress, and these differences are reconciled with the general position of the metals in the hydrothermal series. The phenomenon responsible for this impedance is held to be exosmosis if the metal is in true solution and dialysis of ultrafiltration if the metal is in colloidal form. It is argued from the work of Freundlich and others that there is, in fact, a difference only in degree and not in kind between these phenomena.

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The physical chemistry of the process is first dealt with, after which examples of impounding structures in the field and in the literature are described, commencing with the present author's original paper on impounding some years ago. Finally, the possible applicability of the theory to regional replacement is discussed. - Author's abs.

8606. Melton, F. A. Aerial Photography Aids Geologists. Oil Weekly, Houston, Tex., vol. 121, No. 4, 1946, pp. 48-50, 60.

The use of stereoscopic vision, shadow effects, photoindices, and mosaics as aids in the geological interpretation of aerial maps is discussed. Observations are given on the reproducibility and diagnostic value of structural irregularities, drainage patterns, plains, plateaus, weathering, erosion, creep, slump, etc. The value of aerial photographs varies with types of relief and depends primarily on the ability to recognize bedding and interpret topographic form. - V. S.

8607. National Oil Scouts and Landmen's Association. Oil and Gas Field Development in United States, 1944. Austin, Tex., Yearbook 1945, vol. 15, 926 pp.

This yearbook is a symposium of reviews of oil and gas developments in 1944 contributed by district-association editorial staffs and members. It covers geological and geophysical prospecting, wildcat exploration, proven field extensions, leasing, production, and refining in 25 States and the United States as a whole; information is largely statistical. The sections on some States include figures on the success of geophysical and other methods in locating productive wells. Such figures on all the 25 States are given in an appendix on exploratory drilling by F. H. Lahee. - V. S.

8608. National Research Council, U. S. A. Tectonic Map of the United States. Committee on Tectonics, Washington, D. C., 1944, 2 sheets. Price, $2.

This tectonic map of the United States, 1: 2,500,000, in seven colors, is prepared as an aid to structural studies, especially those of broad regional scope. It is identical in scale with the Geological Map of the United States issued by the U. S. Geological Survey in 1932, so that the two maps can be used to supplement each other. An explanatory statement by C. R. Longwell appeared under the same title (Bull. Am. Assoc. Petrol. Geol. vol. 28, 1944, pp. 1767-74); it deals with the progress of the work during 1922-44, the problems encountered, techniques of delineation, and color treatment. A preliminary edition of the map was distributed throughout the United States in 1940 to provide for corrections. (A review appeared in Jour. Geol., vol. 54, No. 1, 1946, p. 63.) - V. S.

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3609. Reed, L. C. San Pedro Oil Field, Province of Salta, Northern Argentina. Bull. Am. Assoc. Petrol. Geol., Tulsa, Okla., vol. 30, No. 4, 1946, pp. 591-605.

The San Pedro oil field in the Province of Salta is the most important of the seven fields of northern Argentina. Like the others of the region, it is situated in the Tarija Basin of Permo-Carboniferous age, with total sedimentary deposits probably exceeding 10,000 meters in thickness. The oil within the fields of this basin is considered to be primarily of Devonian origin and is found irregularly accumulated in various formations up to and including Pleistocene.

The characteristic form of the structures in the Tarija Basin is a thrust-faulted anticline, and in a number of places it appears that the faulting has been the dominant feature, folding being somewhat superficial and late in the structural development. From this it is inferred that possibly the generation and migration of oil from a source bed could be postponed, without adverse results, until the advent of the first effective folding. - Author's abs.; abridged by V. S.

3610. Rinehart Oil News Co. of Oklahoma. Rinehart's Yearbook 1946. Tulsa, Okla., 1946. Price $10.

A statistical account is given of new pool discoveries in 15 oil-producing States of the United States during 1945. In that year, the petroleum industry gradually returned to peacetime levels. As regards prospecting, new areas were covered, and the already producing areas were subjected to further scrutiny. East of the Mississippi, exploratory surveys probed the Atlantic and Gulf coasts. In the central United States, the Desha Basin attracted attention. West of the Mississippi, activities increased in northwestern New Mexico, northeastern Arizona, and parts of Utah and Colorado. - V. S.

3611. Rittenhouse, G., and Carter, E. The Texture of Mississippian, Upper Devonian, and Lower Pennsylvanian Sandstones in the Appalachian Basin. U. S. Geological Survey, Washington, D. C., mim. text & table 125,183, 1946, 28 pp.

A textural analysis of outcrops and well samples promises to become a useful method for locating stratigraphic traps of oil and gas in the Appalachian basin. It is based upon the dependence of texture on the hydraulic conditions prevailing during the accumulation of sediments. Bars, beaches, and other sedimentary forms containing oil and gas are formed by the action of currents and waves, which vary from place to place and determine texture. The zones where permeable sands grade into less permeable silts and shales constitute potential stratigraphic traps, and they can be located. Being unrelated to structure, these traps would not be detected by the methods now employed. With sufficient data, it further may be possible to work out textural gradients indicative of reservoir conditions.

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The authors present textural (size) analyses of 272 outcrop samples and 420 well samples from the sandstones of Ohio, Pennsylvania, and West Virginia. These data constitute the greatest amount of textural material of its kind accumulated in the Appalachian basin. The relation of texture to the occurrence of oil and gas will be worked out after more information is gathered. - V. S.

8612. Roberts, John. The Parent Substance of Petroleum. Petrol. Times, London, vol. 49, No. 1,257, 1945, pp. 793-795.

In their totality, the author's investigations of the major oil regions of the world, his theoretical studies, and the research of other men appear to indicate that oil deposits have resulted from two factors: (a) Natural distillation of organic matter, mainly animal, but partly vegetable, the essential temperature being 300° to 600° C., and (b) liquefaction by hydrogenation characteristic of some districts. Accordingly, the extent and productiveness of an oil field seem to depend largely on three conditions: the ruling temperature, the quantity of distillable organic matter, and the proximity of an adequate reservoir in the neighboring strata. (Last paper of a series dealing with the origin of petroleum.) - V. S.

8613. Seward, Albert. Geology for Everyman. Cambridge Univ. Press, Englan 1944, 312 pp. Price $3.25.

The author first develops elementary principles and necessary facts preparatory to his systematic unfolding of British geology. His main purpos is then accomplished with the help of a series of journeys through the British Isles, which supply much of the material used to build and illustrat the histroical story. Simple significant observations are made and fitted together properly, and from these the reader is led logically to the interpretations and conclusions which geologists have reached. Interest is aroused through the observations, imagination is stimulated by the methods and results, and the study becomes easy. - R. T. C., Jour. Geol., vol. 54, No. 2, 1946, p. 135, abridged by V. S.

8614. Srewsbury, R. D. A Theory on Occurrence of Salt Domes. Oil Weekly, Houston, Tex., vol. 122, No. 1, 1946, pp. 36-39.

A theory on the occurrence of salt domes is presented to further oil exploration of the continental shelf in the Gulf of Mexico and Caribbean Sea It explains why domes occur in clusters and where the clusters should be sought.

Salt forms large beds by precipitation from the waters of inland seas. As other sedimentary materials are washed in and accumulate, a heavy overburden is formed which presses on the salt, renders it plastic, and forces it upward. Experiments have shown that the salt rises under such pressure along the perimeter of a basin when the bottom is round.

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All the necessary conditions of this mechanism are found in the Gulf and Caribbean basins, which have served as a setting pit for erosional debris from both continents. The thickest salt beds were formed in the central part, where subsidence was greatest. In the resulting bowl-shaped basins the salt plugs should have risen about the perimeter. Therefore, salt domes would be expected to cluster along the ancient shoreline of the Gulf and the Caribbean Sea regardless of where the present shoreline is. - V. S.

8615. Strakhov, N. M. On the Theory of Salt Tectonics. Compt. rend. (Doklady), Acad. Sci. U.R.S.S. Moscow, vol. 47, No. 6, 1945, pp. 421-424.

In 1941-43, the author investigated the salt formations of the Ishimbaevo oil region near the Urals. He reports that local evidence contradicts the customary interpretation of salt tectonics. Usually, a decisive part in the origin of piercements is attributed to the hydration of anhydrites. In the Ishimbaevo diapir folds, however, gypsum attains a very insignificant thickness, 15 to 20 meters, whereas the bulk of the intrusions is composed of anhydrites. Thus, the hydration of anhydrites has not played an important role here. The invasion of anhydrites into the roof was effected by the same forces that squeezed the plastic rocks from under the troughs. Inasmuch as the upper layers of these rocks happened to be anhydrites, they were the first to be forced into the roof. During further diapirisms, the salt apparently became likewise involved in the intrusion. - V. S.

8616. Struth, H. J. Cost of Discovering New Petroleum Reserves Continued to Increase in 1945. Petrol. Eng., Dallas, Tex., vol. 17, No. 5, 1946, pp. 51-58.

Manifold statistics on the cost of petroleum exploration in the United States during 1941-45 are presented. In this period, exploration increased 41 percent despite adverse conditions, the results of that effort showed a decrease of 58 percent, and the costs mounted 256 percent. Between 1936 and 1940, the cost of finding oil had been about 10.5 cents per barrel; in the last 5 years it increased by 35 cents per barrel.

The causes of higher costs lie in the greater number of exploratory wells drilled and the decrease in the quantity of oil found. For instance, 6,000 more holes were drilled in the last 5 years and three times as much money was spent on exploration, but only 55 percent as much oil was detected as in the preceeding 5 years. Discoveries per successful wildcat proved only 22 percent as fruitful; more particularly, in 1945 the failures to find oil or gas were 38 percent greater than in 1944. Two billion barrels would have to be discovered each year to meet future demand; at the discovery rate of the last 5 years, it would take 50,000 wells a year to meet requirements. - V. S.

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8617. Technical News Bulletin. New Mathematical Tables. Nat. Bu. Stand., Washington, D. C., No. 348, 1946, p. 32.

Five additional tables prepared by the Bureau's Mathematical Tables Project have been published: (1) MT34, inverse interpolation for eight-, nine-, ten-, and eleven-point direct interpolation; (2) MT35, table of coefficients for double quadrature without differences, for integrating second order differential equations; (3) MT36, formulas for direct and inverse interpolation of a complex function tabulated along equidistant circular arcs; (4) table of arc sin x, Columbia Univ. Press; and (5) table of associated Legendre functions, Columbia Univ. Press. - Condensed by V. S.

10. PATENTS

(The figure in parentheses refers to the class in which the entry stands; see list in the table of contents.)

8618. (2) Magnetic Field Responsive Device. L. F. Beach, Merrick, N. Y., and J. C. Purves, Springfield, Mass., assignors to The Purves Corp., Springfield, Mass., a corporation of Massachusetts. U. S. Patent 2,374,166 issued April 24, 1945.

In a device sensitive to an external magnetic field and adapted to produce, through interaction with an external field, voltage outputs of double the frequency of the energy employed in exciting said device, an H-shaped core of permeable magnetic material connected together at its ends to form two closed magnetic paths for the circulation of flux therein having a common leg, a pair of coils mounted on each of the portions of said core extending laterally from said common leg, the coils of each pair being on opposite sides of said common leg, said coils being connected in series in a closed, bridge circuit, a source of periodically varying, exciting voltage connected across one diagonal of the bridge circuit and an output circuit connected across the other diagonal of said bridge circuit, said coils being so constructed, correlated, and connected as to buck out components of fundamental, exciting voltage across said output when said bridge is balanced, but to supply in nonbucking relation to said output the double frequency voltage components produced in said coils through interaction with the external magnetic field. - Claims allowed, 2.

8619. (2) Flux Valve. C. F. Fragola, Brooklyn, M. C. Depp, Hempstead, and R. S. Curry, Jr., Baldwin, N. Y., assignors to Sperry Gyroscope Co., Inc., Brooklyn, N. Y., a corporation of New York. U. S. Patent 2,389,146, issued November 20, 1945.

A flux valve comprising a pair of cores each arranged in the form of similar closed frames and disposed in substantially parallel relation, means for exciting said cores with oppositely circulating fluxes of sufficient amplitude to produce varying permeability in each of said cores, and a

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plurality of pick-up coils, each surrounding both of said cores, whereby the voltages produced in said pick-up coils will correspond to the direction of an external magnetic field with respect to the sides of said core. - Claims allowed, 13. (See also abs. 8512 in this issue. - V. S.).

8620. (2) Means for Measuring Magnetic Fields. Gustav Barth, Berlin, Germany; vested in the Alien Property Custodian. U. S. Patent 2,390,051, issued December 4, 1945.

A system for measuring a substantially unidirectional magnetic field, comprising two magnetizable core sections of elongated shape to be exposed to said field, said sections being arranged in similar directions relative to each other, circuit means magnetically associated with both said sections for alternately magnetizing said sections in opposite directions, and current-responsive indicating means connected with said circuit means for indicating the differential effect of the resultant magnetizations of said sections on the current in said circuit means. - Claims allowed, 2.

8621. (3) Lowering Device for Large Cartridges. Thomas Dove, Jr., Pottsville, Pa., assignor to American Cyanamid & Chemical Corporation, New York, N. Y., a corporation of Delaware. U. S. Patent 2,387,701, issued October 23, 1945.

In combination an explosive package, an elongated rod penetrating the same, the end of which projects through the package, the projecting end of the rod being perforated, a breakable skewer in the perforated end of the rod, and a lowering device attached to the opposite end of the rod. - Claims allowed, 2.

8622. (3) Spray Deflector for Shot Holes. S. D. Rogers, P. J. Rudolph, and W. L. Crawford, San Antonio, Tex., assignors to Olive S. Petty, San Antonio, Tex. U. S. Patent 2,387,770, issued October 30, 1945.

A deflector for deflecting debris ejected from a shot hole in the firing of an explosive charge in conducting seismic surveys, including, in combination, a shot hole casing, a fitting releasably connected to said casing, a deflector plate hinged at its bottom to said fitting and shaped and positioned to extend in deflecting relation to the bore of said casing, and means to removably secure the plate in said position, whereby it may be swung clear of said bore for charging and tamping the bore of said casing. - Claims allowed, 5.

8623. (3) Stemming Device for Explosive Charges. C. O. Tappan, Brooklyn, N. Y.; Edward J. S. Farrell, administrator of said C. O. Tappan, deceased, assignor to Kirby H. Tappan, East Hartford, Conn. U. S. Patent 2,388,232, issued October 30, 1945.

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A blasting plug, including a taper mandrel disposable coaxially of the explosive-charge-receiving hole and provided at its larger end with an inner flanged head; plug sections, each having an inner tapered face slidable on the mandrel, the sections and mandrel together forming an approximately cylindrical plug; a resilient tube around the sections and said head; the sections being movable inwardly on the mandrel to compress the tube against the wall of the hole leaving a chamber between the sections and said head, the inner end lip of the tube lying against the peripheral face of the head; a resilient washer disposed around the inner end of the mandrel and closing the spaces between the sections; said head being provided with an aperture between the chamber and the face of said head at the charge; pressure of the explosive gases pressing said lip onto the head to confine and force the gases against the head to force outwardly the mandrel to further expand the sections; said washer and lip serving as a check valve to prevent outward passage of gas during the explosion, and serving to admit the inward passage of flame through said spaces and aperture and around the head, when a secondary charge is exploded at the outer end of the plug, to explode an inner charge that has misfired. - Claims allowed, 8.

8624. (3) Electric Detonator. Joseph Stuart, II, Wilmington, Del. U. S. Patent 2,389,086, issued November 13, 1945.

An electric firing device which comprises a charged shell; an ignition assembly comprising a plug of hard dielectric material inserted into the shell, said plug being of sufficient hardness and size to expand said shell and thereby provide a waterproof joint between the shell and the plug; and a bulge in that portion of the shell in contact with the plug, said bulge being formed by insertion of the plug into the shell. - Claims allowed, 6.

8625. (3) Seismic Surveying. J. A. Sharpe, Tulsa, Okla., assignor to Stanolind Oil & Gas Co., Tulsa, Okla., a corporation of Delaware. U. S. Patent 2,390,187, issued Dec. 4, 1945.

Apparatus for seismic surveying, including means for generating seismic waves, a plurality of electric seismometers, each responsive only to the simultaneous rotational effect of the horizontal and vertical components of transverse waves, and means for recording the output of each said seismometer on a common record as a function of time in a manner to record each of said outputs distinguishably from the others of said outputs. - Claims allowed, 9.

8626. (3) Seismic Surveying. J. O. Parr, Jr., San Antonio, Tex., assignor to Olive S. Petty, San Antonio, Tex. U. S. Patent 2,390,322, issued December 4, 1945.

In apparatus for use in seismic surveying, the combination with a seismometer for converting incoming seismic energy into electrical wave-form

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signals and means for amplifying and recording such signals, said amplifying means including thermionic valve amplifiers, means for so varying the internal resistance of one of said valves in response to variation in amplitude of such energy as to maintain the major portion of the record within usable amplitude limits, and means responsive only to the arrival of energy of amplitude excessively large as compared to the amplitude of reflected waves for varying the internal resistance of one of said valves with substantially greater rapidity than said first named resistance varying means. - Claims allowed, 5.

8627. (3) Directional Seismograph Pickup. R. J. Roberts, Houston, Tex., assignor to Standard Oil Development Co., a corporation of Delaware. U. S. Patent 2,390,328, issued December 4, 1945.

A seismic pickup comprising, in combination, a support, a body, a coil spring suspending the body from said support, means carried by said body arranged for producing a plurality of magnetic fields, with one field having a vertical direction of departure and each remaining field having a horizontal direction of departure, and with the direction of departure of each field of said plurality of magnetic fields making an angle with the direction of departure of the remaining fields, and a plurality of pickup coils mounted on said support with each coil adjacent one of said magnetic field sources. - Claims allowed, 10.

8628. (3) Seismic Surveying. W. H. Mayne, San Antonio, Tex., assignor to Olive S. Petty, San Antonio 6, Tex. U. S. Patent 2,400,245, issued May 14, 1946.

In apparatus for use in seismic surveying, the combination with a seismometer for converting seismic impulses to electrical energy, a thermionic valve amplifier for such energy, and a recorder at a remotely located recording station for recording the amplified energy, of two conductors affording a path over which the amplified energy is transmitted from the amplifier to the recorder, gain control means associated with said amplifier, said gain control means including connections to the valve grids for applying thereto a variable bias voltage, means at the recording station operatively connected through said conductors with said gain control means to provide the said bias voltage and thereby to effect regulation from said recording station of the amplifier gain, and filter means associated with said gain control means for blocking from the amplifier the energy of seismic frequencies transmitted through said conductors while permitting the application to said grids of the bias voltage provided at the recording station. - Claims allowed, 3.

8629. (4) Electrical Logging. C. B. Aiken, North Plainfield, N. J., assignor to Schlumberger Well Surveying Corporation, Houston, Tex., a corporation of Delaware. U. S. Patent 2,390,409, issued December 4, 1945.

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Apparatus for investingating earth formations traversed by a bore hole, comprising a pair of spaced-apart electrodes in the bore hole, an electrical network in the bore hole and connected to said electrodes to form an impedance bridge, of which the electrodes and the intervening formation constitute one arm, high and low frequency sources of alternating current at the surface of the earth, an electrical circuit connected to said sources and said impedance bridge for supplying high- and low-frequency alternating current to the energizing diagonal of the latter, a plurality of filter means connected to the output diagonal of said bridge for separating the high- and low-frequency outputs of the bridge, a plurality of rectifying means connected to said respective filter means, indicating means at the surface of the earth, and electrical circuit means including said first-named electrical circuit for transmitting the outputs of said rectifying means to said indicating means. - Claims allowed, 5.

8630. (4) Method of and Apparatus for Electrically Determining the Formation in Wells. G. H. Ennis, Long Beach, Calif., assignor of one-half to Robert V. Funk, Long Beach, Calif. U. S. Patent 2,397,255, issued March 26, 1946.

In an apparatus for locating strata in a well in which a casing has been installed, the combination of: an external circuit between said casing and the earth; an external circuit between an electrode in said well and the earth; means for reversing the electrical potential in at least one of said electrical circuits; means for moving said electrode in said well; and means for measuring the electrical changes in at least one of said external circuits. - Claims allowed, 25.

8631. (4) Electrical Prospecting Method and Apparatus. J. W. Millington, Beaumont, Tex., assignor to Sperry-Sun Well Surveying Co., Philadelphia Pa., a corporation of Delaware. U. S. Patent 2,398,800, issued April 23, 1946.

The method of determining the location and character of strata penetrated by a bore hole comprising providing by means of a logging apparatus a plurality of different responses of the strata to the presence of the logging apparatus, producing an alternating current, varying the amplitude of said alternating current in accordance with variations in one of said responses, and simultaneously varying the frequency of said alternating current in accordance with variations in another of said responses. - Claims allowed, 12.

8632. (4) Apparatus for Electrical Well Logging. R. W. Stuart and Daniel Silverman, Tulsa, Okla., assignors to Stanolind Oil & Gas Co., Tulsa, Okla., a corporation of Delaware. U. S. Patent 2,398,868, issued April 23, 1946.

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An electrode device for use as one or more of the electrodes of an electrical well-logging system, said device comprising a gun provided with a bore, a projectile electrode disposed within said bore, means for driving said electrode from the bore, and electrically conductive means insulated from said gun for maintaining electrical connection with said electrode after the electrode has been driven from the bore. - Claims allowed, 3.

8633. (4) Electrical Prospecting Method and Apparatus. J. M. Pearson, Aldan, Pa., and C. R. Nichols, Dallas, Tex., assignors to Sperry-Sun Well Surveying Co., Philadelphia, Pa., a corporation of Delaware. U. S. Patent 2,401,371, issued June 4, 1946.

A system for logging a borehole, comprising a pair of electrical circuits each including a pair of electrodes, means for moving at least one electrode of each pair along the borehole in fixed spaced relation to each other, means for impressing a voltage across one pair of electrodes, means for periodically reversing the direction of said voltage, and means, in the other circuit, for separately and simultaneously exhibiting the effect on said circuit of the voltage impressed across the first pair of electrodes and of the natural earth potential between said second pair of electrodes comprising a pair of potentiometers, each including a voltage recording device, means for periodically reversing the voltage reading on one of said devices due to the impressed voltage across the first pair of electrodes while maintaining the voltage reading due to natural earth potential thereon unidirectional and means for periodically reversing the voltage reading on the other of said devices due to the natural earth potential while maintaining the voltage reading thereon due to the impressed voltage on the first pair of electrodes unidirectional. - Claims allowed, 6.

8634. (5) Well Survey Method and Apparatus. R. E. Fearon, Tulsa, Okla., assignor to Well Surveys, Inc., Tulsa, Okla., a corporation of Delaware. U. S. Patent 2,390,433, issued December 4, 1945.

A method of geophysical prospecting that comprises at various levels from a well bore or other opening in the earth bombarding the adjacent strata with neutrons, simultaneously at substantially the same level separately measuring the gamma rays and neutrons returning to the well bore from the strata, simultaneously determining the depths at which said measurements are made and recording said measurements in correlation with said determinations of depth. - Claims allowed, 17.

8635. (5) Central Electrode Support. S. A. Scherbatskoy, Tulsa, Okla., assignor to Well Surveys, Inc., Tulsa, Okla., a corporation of Delaware. U. S. Patent 2,390,965 issued December 11, 1945.

An ionization chamber adapted for use in detecting radioactivity comprising in combination a housing, an ionizable medium in said housing, a pair of cylindrical electrodes disposed in said ionizable medium within the

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housing, separate means for supporting the electrodes in concentric relationship, means forming electrical connection with said electrodes and extending outside of said housing, said means for supporting the central electrode comprising an element adapted to telescopically fit within the bottom of the central electrode, annular shoulders on said element adapted to slidably engage the inner wall of the electrode and serve as a guide when the element and electrode are moved relative to each other, means for limiting the movement of the element relative to the electrode, resilient means disposed within said central electrode and the telescoping element adapted to exert outward pressure on the telescoping element, and an insulator carried by the bottom end of the telescoping element adapted to support the telescoping member and central electrode resiliently supported thereby, whereby mechanical play imparted to the ionization chamber will be absorbed by the resilient means. - Claims allowed, 5.

8636. (5) Well Surveying. Bruno Pontecorvo, Montreal, Quebec, Canada, assignor to Well Surveys, Inc., Tulsa, Okla., a corporation of Delaware. U. S. Patent 2,398,324, issued April 9, 1946.

In a radiation method of logging a cased drill hole that penetrates the substrata of the earth, the improvement of simultaneously locating a cement that contains a neutron-absorbing substance disposed behind the casing in the drill hole that comprises the steps of radiating neutrons towards the walls of the drill hole from a neutron emitting source as said source traverses the drill hole and detecting secondary gamma radiations of a certain intensity from that portion of the strata surrounding the casing that is free of cement and detecting gamma radiations of different intensity from the strata adjacent the cement, thereby producing by the differences in intensity of the detected gamma radiations an indication of the location of the cement in the bore hole on a log which when recorded in correlation with the depth will be in the form of an offset. - Claims allowed, 2.

8637. (7) Electrical Method of and Apparatus for the Analysis or Identification of Gases, Vapors and the Like. L. T. Winkler, London, England. U. S. Patent 2,387,550, issued October 23, 1945.

A method of analyzing mixed gases or vapors, which comprises the steps of (a) producing an electric field between electrodes exposed to the mixture of gases to be identified to remove fortuitous ions from the gas, (b) ionizing a gas near one electrode of said field, (c) reversing the direction of the field for a period of time to cause the ions to travel from said electrode through different distances according to their respective ionmobilities (d) producing an electric field transverse to the said travel of the ions, (e) collecting the ions from a group or groups on an electrode, and (f) measuring the charge imparted to said electrode. - Claims allowed, 11.

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8638. (7) Apparatus for Gas Analysis. P. S. Williams and M. W. Kriegel, Tulsa, Okla., assignors to Standard Oil Development Co., a corporation of Delaware. U. S. Patent 2,389,706, issued November 27, 1945.

An assembly adapted for analyzing gases comprising, in combination, a scrubbing means, an evacuating means including a mercury diffusion pump and a mechanical pump, a first conduit and a second conduit each connecting said scrubbing means with said diffusion pump, a stopcock controlling flow in each of said conduits adjacent said scrubbing means, a triple trap and U tube inserted in the first conduit, a reservoir, a conduit connecting the reservoir with the first conduit, a pressure-gage assembly, a conduit fluidly connecting the assembly to the first conduit between said triple trap and said U tube, a mercury reservoir arranged adjacent said U tube, a conduit fluidly connecting a lower portion of the U tube with a lower portion of the reservoir, a conduit arranged for connecting said reservoir with said mechanical pump, a stopcock in said conduit, a conduit having stopcock therein connecting an upper portion of the reservoir with the atmosphere whereby mercury may be forced into and removed from said U tube. - Claims allowed, 5.

8639. (7) Method of Prospecting for Hydrocarbons. F. W. Crawford, Bartlesville, Okla., assignor to Phillips Petroleum Co., a corporation of Delaware. U. S. Patent 2,398,580, issued April 16, 1946.

The method of analyzing a sample of drilling mud for hydrocarbons, which comprises placing the sample in an isolated heating zone, rapidly evacuating the readily releasable gases and vapors from the same and separating the vapors and gases thus released from the process, evacuating an isolated condensing zone, establishing communication between the condensing zone and the heating zone, applying heat to the sample in the heating zone, removing heat from the vaporous effluents of the sample in the condensing zone to condense readily condensible vapors, and analyzing the uncondensed effluents for hydrocarbon content. - Claims allowed, 3.

8640. (7) Geochemical Prospecting. Leo Horvitz, Houston, Tex. U. S. Patent 2,400,420, issued May 14, 1946.

A method of geochemical exploration for subterranean petroliferous deposits, which comprises collecting samples of soil at spaced points in the area to be investigated at a depth several feet below the surface, said depth being sufficient to eliminate the effect of surface conditions, subjecting the individual samples to an analysis for the determination of the content thereof of a selected alkaline-earth metal and correlating the values determined with sample locations whereby the contents of the selected metal in the several samples may be compared for the purpose of identifying anomalously high concentrations thereof. - Claims allowed, 4.

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8641. (8) Means for Testing Formations in Wells. E. V. Crowell, Glendale, Calif. U. S. Patent 2,397,473, issued April 2, 1946.

In a well-testing device for use in a well shaft, a pair of telescopically connected tubular members, one of said members forming a head for a packer and having a lateral port therein communicating the bore of the lowermost tubular member below the packer with the well shaft above the packer through said head, a single valve member movable in said head and actuated by telescopic contraction of said tubular members to close said communication with the well shaft and open communication between said tubular members through said head, and means operable in response to relative rotation between said members for controlling relative movement between said members longitudinally. - Claims allowed, 2.

8642. (9) Method of and Means for Making Fine Measurements. J. R. Cornelius Coventry, England. U. S. Patent 2,387,496, issued October 23, 1945.

In a precision measuring indicator, the combination of an oscillator generating a wave of fixed frequency, a second oscillator for generating a wave having a frequency normally differing from the frequency of said first oscillator by a predetermined difference frequency, means for combining said waves to produce a beat wave of said difference frequency, a distance-measuring device including a movable element for varying the frequency of said second oscillator in accordance with the position of said element and being operative to vary said beat frequency above and below said normal difference frequency, a pair of tuned circuits, one tuned to a frequency higher than said normal difference frequency and the other to a frequency lower than said normal difference frequency, means for supplying said beat wave to said tuned circuits, means for rectifying the currents in said tuned circuits to produce direct current voltages, and an indicator circuit having said direct current voltages included therein in opposing relation. - Claims allowed, 6.

8643. (9) Apparatus for Continuously Predicting a Trend in Observed Data. Herbert Ziebolz, Chicago, Ill., assignor to Askania Regulator Co., Chicago, Ill., a corporation of Illinois. U. S. Patent 2,398,987, issued April 23, 1946.

Indicating apparatus of the character described comprising, in combination, a graphing device including a casing having a coordinate axis chart face; indicating members equally spaced along the abscissa axis and movable parallel with the ordinate axis having heads exposed on the chart face; screw members for actuating the indicating members to produce the outline of a graph representing characteristics of data; pairs of adding and subtracting solenoids associated with each of the screw members to impart actuating movements in either direction in accordance with the characteristics of data to be investigated; automatic means for measuring characteristics of variable specimens to be investigated and energizing the adding

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solenoids in accordance with such measurements to produce a graph; and associated means for energizing the subtracting solenoids after the characteristics of a predetermined number of specimens have been added, whereby continued operation will add and subtract impulses as additional specimens are measured. - Claims allowed, 16.

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